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(71) Applicant *(for all designated States except US)*: **PROLATUS, INC.** [US/US]; 4000 Olson Memorial Highway, Suite 220, Golden Valley, MN 55422 (US).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **HOEKSTRA, Jeffrey, D.** [US/US]; 1400 East Como Blvd., St. Paul, MN 55117 (US). **ATKINSON, Donald** [US/US]; 2442 Lost Lake Road, Mound, MN 55364 (US). **RYWELSKI, Chris** [US/US]; 422 Tyler Avenue South, Edina, MN 55343 (US).

(74) Agents: **SCHWAPPACH, Karl, G.** et al.; Faegre & Benson LLP, 2200 Wells Fargo Center, 90 South 7th Street, Minneapolis, MN 55402-3901 (US).

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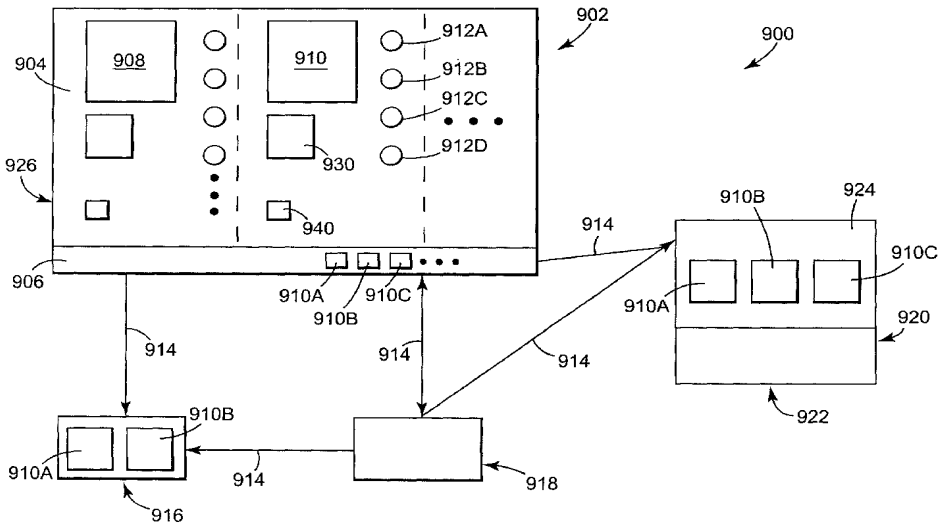
(54) Title: ELECTRONIC IMAGE MANAGEMENT SYSTEM



(57) Abstract: A system and method for managing electronic images (900). High resolution digital master image files (908, 910) and/or compressed copies of the high resolution digital different versions (912A, 912B, 912C, 912D) to high resolution digital master image file (908). The high resolution digital master image file (908) and/or compressed copies thereof are transferred from the first location (926) to a second location (918) along with one or more of the script files. The compressed copies are decompressed. One or more of the script files are applied to the high resolution digital master image file (908) or the decompressed copy file of the high resolution digital image file (908) at the second location (918) to produce one or more different versions of the high resolution digital master image file at the second location (918) to produce one or more different versions of the high resolution digital master image file.

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ELECTRONIC IMAGE MANAGEMENT SYSTEM

Cross- Reference to Related Applications

The present application claims priority to U.S. Provisional Application No. 60/282,637, filed April 9, 2001.

Field Of the Invention

The present invention relates generally to an electronic image management system, and more particularly, to a method and apparatus for storing multiple versions of high resolution digital master image files as script files. The script files require significantly less storage space than multiple full resolution versions of the digital master image files and can be transmitted with less bandwidth. The present application is also directed to a single compression of the high resolution digital master image files that can be easily transferred to second and third locations. After transfer, the compressed version is decompressed and one or more script files is applied to create a version of the high resolution digital master image.

Background Of the Invention

Many types of businesses have the need to store high resolution digital image files for use in advertising, printing and other applications. High resolution digital image files can take up a significant amount of computer disk storage space and transferring high resolution digital images over communications systems is typically slow.

Compounding the problem of storing and transferring high resolution digital images is the fact that multiple versions or edits of the high resolution digital images are often required. For example, a high resolution digital image file of an article of merchandise can be retouched to show the same article in different colors. This allows the owner of the image to use the same image to illustrate multiple products. Each color of the versions of the high resolution digital image may also be stored in a 4-color separation mode for use in news print applications. The same image may also be stored in a different version for use in a corporate report or with other substantive changes, such as text or background modifications. Consequently, a single

high resolution digital image can quickly multiply into a plurality of high resolution digital images, each requiring a significant amount of computer disk storage space.

Additionally, digital image files are often generated at one location and modified, adjusted, corrected or made ready for use at a different site. Traditionally the process begins with the generation of a high resolution digital image file at an image origination site. Image origination sites may include, but are not necessarily limited to, photo studios with a digital camera, design firms with desktop scanners, or photo labs having CD image facilities. Once generated at an image origination site, the high resolution digital image file is transferred to a "color trade shop" at an image modification site remote from the image origination site where a "color" expert performs the necessary corrections and prepares the image for printing, multimedia or internet use. The corrections or adjustments made to the file may include, but are not limited to, exposure correction, neutralizing color casts, optimization of reproduction range, image silhouetting, color alteration, retouching and color space conversion.

Transferring the high resolution digital image file to the image modification site may be performed in one of a variety of well known methods. A first transfer method is via high speed digital data transmission lines such as, but not limited to, T1 or ISDN. While this transfer method is fast, it is nonetheless disadvantageous in that it is very costly. A second transfer method is via traditional modem and telephone line. This method offers a low cost of implementation, but is extremely slow and unreliable due to long transmission times. A third transfer method is via courier/overnight mailing services which, as will be appreciated, are expensive and far slower than digital data transmission.

Transmission via an Intranet network may also be employed where the "color trade shop" facility is part of the same organization as the image generator, such as where a large corporation has both image generation and image correction operations. However, transferring high resolution digital image files is slow "point to point" within the network and oftentimes results in an overall network slow down. This disadvantageously affects all those connected to the network, including those not involved in digital image transfer.

Once received at the image modification site, the high resolution digital image file can be corrected, adjusted, or modified in any number of desired fashions. These modifications can be performed by a "color" expert on an image-by-image basis. However, working with the high resolution digital image file in this fashion is labor intensive for the "color" expert and therefore time consuming and inefficient. Modifications may also be performed in an automated fashion by applying a "script" of predetermined instructions to the high resolution digital image file to modify the image in a set fashion with little to no need for human intervention. While scripting is more efficient than having a color expert perform the modifications, a drawback exists in that this modification technique is only helpful when batch processing a plurality of images sharing similar characteristics. Rarely, however, do files require the exact same corrections for optimization such that not all problems are corrected accurately.

Whether modified manually by the color expert or automatically via scripting, the newly adjusted full resolution digital image file typically increases in size by as much as 25-30%. As will be appreciated, increasing the size of the high resolution digital image file exacerbates the problem of slow transmission when electronically transferring the corrected high resolution digital image file back to the image origination site.

Brief Summary of the Invention

The present invention is directed to a method of managing electronic images. High resolution digital master image files are stored at a first location, along with script files corresponding to different versions to the high resolution digital master image file. The different versions can be generated by application of one or more script files to the high resolution digital master image file. In this way, only one copy of the high resolution digital master image file is required.

In one embodiment, the high resolution digital master image file is transferred from the first location to a second location along with one or more of the script files. One or more of the script files are applied to the high resolution digital

master image file at the second location to produce one or more different versions of the high resolution digital master image file.

In another embodiment, the high resolution digital master image file is transferred from the first location to a second location. An operator performs at the second location at least one image modification on at least a portion of the high resolution digital master image file. Instructions representing the image modifications are saved at the second location as a supplemental script file. In one embodiment the supplemental script file is transferred from the second location to the first location.

In another embodiment, the supplemental script file and the high resolution master image file are transferred from the first location to a third location, such as a printer. The supplemental script file is applied to the high resolution master image file at the third location to produce a different version of the high resolution digital master image file. In another embodiment, other script files are also transferred from the first location to the second location and applied to the high resolution digital master image file. In yet another embodiment, the supplemental script files are transferred directly from the second location to a third location.

The step of transferring the high resolution digital master image file from the first location to the second location can include transferring at least a portion of the high resolution digital master image file to the second location as streaming data. In one embodiment, transfer of the one or more script files and the high resolution digital master image file from the first location to the printer can be initiated from the second location.

The script files can be adapted to convert the high resolution master image file from one color space to another color space, to apply edge definition, to perform pixel level editing and/or to alter one or more color on at least a portion of the high resolution digital master image file.

The present invention is also directed to a method and apparatus for storing a high resolution digital master image file and a compressed copy of the high resolution digital master image file at the first location. One or more script files

corresponding to versions of the high resolution digital master image are also stored at the first location.

In one embodiment, the compressed copy file is transferred along with one or more of the script files from the first location to the second location. The compressed copy file is decompressed at the second location to obtain a decompressed copy of the high resolution digital image file. One or more of the script files is applied to the decompressed copy file at the second location to produce one or more different versions of the high resolution digital master image file.

In another embodiment, at least one image modification is performed at the second location on at least a portion of the decompressed copy. Instructions representing the image modifications are saved at the second location as a supplemental script file. The supplemental script file is typically transferred from the second location to the first location.

In another embodiment, the supplemental script file and the compressed copy file are transferred from the first location to a third location, such as a printer. The compressed copy file is decompressed at the third location. The supplemental script file is applied to the decompressed copy file at the third location to produce a different version of the high resolution digital master image file.

In another embodiment, the supplemental script file and the high resolution master image file are transferred from the first location to a third location. The supplemental script file is applied to the high resolution digital master image file at the third location to produce a different version of the high resolution digital master image file. In another embodiment, other script files are also transferred from the first location to the second location and applied to the high resolution digital master image file.

The present invention is also directed to an electronic image management system. A first computer system at a first location includes an image archive with one or more high resolution digital master image files and one or more script files corresponding to versions of the high resolution digital master images. A second computer system at a second location includes a processor programmed to

apply one or more of the script files to one or more of the high resolution digital master image files. A communication system cooperatively couples the first and second computer systems.

The present invention may also include a printer at a third location coupled to the first and second computer systems through the communication system. A compressed copy file of the high resolution digital image files can optionally be located at the first computer system.

Brief Description of the Drawings

Figure 1 is a flow chart illustrating a method of modifying digital images in accordance with the present invention;

Figure 2 is a screen display illustrating the dimensions of a high resolution digital image file to be modified in accordance with the present invention;

Figure 3 is a screen display illustrating the dimensions of a low resolution proxy file based on the high resolution digital image file from Figure 2;

Figure 4 is a screen display illustrating a function for compressing the low resolution proxy file in accordance with the present invention;

Figure 5 is a screen display illustrating the compression options available when saving a file under JPEG compression;

Figure 6 is a screen display illustrating an information window noting the file size information of the compressed low resolution proxy image;

Figure 7A and 7B collectively form a screen display illustrating a sample script for performing various modifications to correct a specific file in accordance with the present invention;

Figure 8 is a screen display illustrating an information window noting the file size of the correction script;

Figure 9 is a block diagram illustrating an image modification system provided in accordance with one embodiment of the present invention;

Figure 10 is a block diagram illustrating an image modification system provided in accordance with an alternate embodiment of the present invention;

Figure 11 is a block diagram illustrating an image modification system provided in accordance with yet another embodiment of the present invention;

Figure 12 is a block diagram illustrating an image modification system provided in accordance with a still further embodiment of the present invention; and

Figure 13 is a block diagram illustrating an image modification system which is a variation of the embodiment shown in Figures 11 and 12.

Figure 14 is a block diagram of the present electronic image management system in accordance with the present invention.

Detailed Description of the Invention

Illustrative embodiments of the invention are described below. In the interest of clarity, not all features of an actual implementation are described in this specification. It will of course be appreciated that in the development of any such actual embodiment, numerous implementation-specific decisions must be made to achieve the developers' specific goals, such as compliance with system-related and business-related constraints, which will vary from one implementation to another. Moreover, it will be appreciated that such a development effort might be complex and time-consuming, but would nevertheless be a routine undertaking for those of ordinary skill in the art having the benefit of this disclosure.

Referring initially to Figure 1, shown is a flow chart illustrating a method of modifying digital images in accordance with the present invention. The digital images to be modified are high resolution images saved in digital media, hereinafter referred to as "high resolution digital image files." The high resolution digital image files may be generated at any number of a variety of image origination sites, including but not limited to, photo studios having digital photographic equipment, design firms having desktop scanning capabilities, or photo labs having compact disk (CD) image generation facilities.

The first step 10 in the method of the present invention involves reducing the pixel count of the high resolution digital image file at the image origination site to create a low resolution proxy file of the high resolution digital image

file. If desired, various other dimensions of the digitized image may be scaled down, such as the height and width. As will be discussed in greater detail below, this can be accomplished using any number of commercially available image correction software applications, including but not limited to *Photoshop* by Adobe Systems, Inc. of San Jose, CA, *Linocolor* by Heidelberg Color Publishing Solutions, Inc. of Hauppauge, NY, *Live Picture* by HCS Software, Inc. of Santa Monica, CA, and *Photoscripter* by Main Event Software, Inc. of Washington, DC.

The terms "high resolution" and "low resolution" are, by definition, relative. It is therefore to be readily understood that the high resolution and low resolution files referred to herein may vary greatly in size and, in some instances, overlap. For example, a high resolution file of an image to be printed in a 2" x 2" in a catalog may be approximately 1.5MB (1,500,000 bytes), while a low resolution file of a painting ready for print at 30" x 40" scale may be approximately 5MB (5,000,000 bytes). This being said, in one embodiment of the present invention, the term "high resolution" is defined as comprising a digital image having a pixel count in the range of approximately 1MB (1,000,000 bytes) to 1GB (1,000,000,000 bytes), while the term "low resolution" is defined as comprising a digital image having a pixel count in the range of approximately 500K (500,000 bytes) to 5MB (5,000,000 bytes). It is to be noted, however, that these pixel count ranges are not critical to the present invention and, consequently, may vary widely (higher or lower) without departing from the scope of the present invention.

The second step 20 involves compressing the low resolution proxy file to produce a compressed proxy file. The low resolution proxy may be compressed using any number of commercially available compression techniques, such as those found within any number of the aforementioned commercially available image correction software packages. As used herein, the terms "compression" or "compressing" are used to denote the process of subjecting the low resolution proxy file to a compression algorithm to further reduce the file size and place it in a compression format such as, but not limited to, JPEG, LZW and FlashPix. The particular compression algorithm selected may vary depending upon the properties of

the digital image to be reduced and, similarly, the size of the compressed proxy file may vary widely depending upon the size of the low resolution proxy file. In one embodiment, the term "compressed proxy file" is defined as comprising a digital file having a pixel count in the range of approximately 100K (100,000 bytes) to 700K (700,000 bytes). A benefit of compressing the low resolution proxy file is that the resulting compressed proxy file, being of reduced size, can be transmitted electronically from the image origination site to an image correction site in a much faster and easier fashion than is otherwise possible when transmitting a high resolution digital image.

The third step 30 in the method of the present invention involves transmitting the compressed proxy file to an image correction site. In a preferred embodiment, the step of transmitting the compressed proxy file to the image correction site is conducted electronically which, as noted above, takes advantage of the small size of the compressed proxy file for reduced transmission times. It may also be desirable to transfer a job ticket along with the compressed proxy file which enumerates for the image correction specialist the corrections and/or image conditions desired on the part of the image generator. Depending upon the location of the image correction site, the compressed proxy file may be transmitted via modem, Intranet, Internet, T1 lines, or any number of now-available or later-developed technologies for transporting such a compressed proxy file. In other words, the image origination site and image correction site may be in separate geographic locations or the same geographic location, so long as each site can be communicatively linked with the other for transmitting images and/or image correction information back and forth.

The fourth step 40 involves decompressing the compressed proxy file at the image correction site to create a restored low resolution proxy file. This decompression function may be accomplished via the chosen image correction software application. In a preferred embodiment, the restored low resolution proxy file will have the same approximate size characteristics as the low resolution proxy file generated in the first step 10, although the file size of the restored proxy file may vary following restoration without departing from the scope of the present invention. If a

job ticket is transmitted along with the compressed proxy file, it too will be opened up at the image correction site to instruct the image correction specialist of any changes or modifications requested by the image generator.

The fifth step 50 involves performing any of a variety of modifications on the restored low resolution proxy file. In a preferred embodiment, these modifications are performed by an image correction specialist to prepare the digital image for printing, multimedia or Internet use. As used herein, "modifications" refers to global or pixel level corrections or adjustments made to the file that may include, but are not limited to, exposure correction, neutralizing color casts, optimization of reproduction range, image silhouetting, color alteration, pixel editing, retouching and color space conversion. The script file may be recorded in any number of commercially available color applications including, but not limited to, *Photoshop*, *Live Picture*, *Linocolor*, and *PhotoScripter*. Applications that can record scripts for pixel edits and retouching is available from Prolatus Software (formerly known as Colorcentric.com, Inc.) of Minneapolis, Minnesota under the tradenames Prolatus Expert and Prolatus Server.

The sixth step 60 involves saving the settings or modifications performed in step 50 as a script file. As used herein, the term "script file" is defined as a file containing the list of instructions representing the modifications performed by the image correction specialist. For example, a script file may include any number of global or pixel level image modification instructions, including but not limited to: set print preferences, tonal adjustments, color cast correction, unsharp mask filtration, convert color space, selective color correction, generate work path to isolate areas, save path as clipping path, and save file in correct file format. It is also to be understood that the "script file" may comprise any single instruction from the before mentioned list saved as an independent setting. The script file may range from 100 bytes to 9K (9,000 bytes) which, as will be appreciated, is relatively small in size compared to a high resolution digital image file. The size of the script file may vary from the above-identified ranges without departing from the scope of the invention.

The seventh step 70 of the present invention involves transmitting the script file from the image correction site back to the image origination site. In a preferred embodiment, the step of transmitting the script file to the image origination site is conducted electronically. Due to the small size of the script file, it may be transmitted back to the image origination site in a quick and easy fashion, especially relative to the transfer of a high resolution digital image file. As with the transfer of the compressed proxy file, the script file may be transmitted to the image origination site via modem, Intranet, Internet, T1 lines, or any number of now-available or later-developed technologies for transporting such a script file.

The final step 80 in the method of the present invention involves applying the script file to the original high resolution digital image file to create a corrected high resolution digital image file. This is performed by playing the script file using the image correction software on the computing station at the image origination site. In a preferred embodiment, the high resolution digital image file will be immediately modified on the display in front of the image generator when the script file is played. In an important aspect of the present invention, this step can be performed by anyone at the image origination site regardless of his or her training or expertise in digital image correction. This is because the individual at the image origination site need only invoke the script file using the given image correction software. By applying the script file to the original high resolution digital image file, the same modifications that were specifically performed by the image correction specialist at the image correction site will be automatically performed at the image origination site to produce a corrected high resolution digital image file of professional quality. The corrected high resolution digital image file is then ready for use as desired.

The present invention advantageously provides the ability to have any operator, lay or otherwise, perform the required image modifications to the original high resolution digital image file without actually transmitting it to the image correction site. This is important in that, by eliminating the need to transmit the high resolution digital image file, the transmission time is drastically reduced. Moreover,

the image origination site does not need sophisticated data transmission facilities because the compressed proxy file and the script file, being much smaller than the high resolution digital image file, can be readily transmitted using standard, relatively inexpensive transmission devices. As will be appreciated, this minimizes the overall cost of undertaking such image correction operations such that any entity, large or small, can compete without undue financial hardship. In this fashion, the present invention overcomes the drawbacks of the prior art image correction operations.

Referring now to Figures 2-8, an exemplary embodiment of the foregoing method will now be described. Figures 2-8 are screen displays or windows as may be displayed to a user on a computer system running one of the various commercially available image correction software packages that can be used in accordance with the present invention. In the following example, the image correction software package is *Photoshop* (offered by Adobe Systems, Inc. of San Jose, CA operating on a *Apple Power Macintosh* system consisting of a monitor, CPU, hard drive, keyboard, and mouse).

Figure 2 is a screen display illustrating the dimensions of a high resolution digital image file to be modified in accordance with the present invention. Pixel Dimensions 90 displays the gross pixel count of a specified file. In the exemplary embodiment, the pixel count is that of the high resolution file, seen here as 86.2MB (86,000,000 bytes approx.). Width and Height 100 displays the width as the actual number of pixel columns (7176) and the height as the actual number of pixel rows (4200). This information provides the user an understanding of the proportionate distribution of data contained in the gross pixel count. Scale adjustments may be made to the digital image file by entering alternate desired values (pixel columns or pixel rows) in the width and height boxes. Pull-down menu 110 allows for the selection of various measuring units for the width and height, either pixel as in the exemplary embodiment or percent. Therefore, if the pull-down menus 110 are set to percent, the scale of the digital image file may be adjusted based upon percentage values entered for the width and height.

A pull-down menu 120 offers unit of measure options in the "Print Size" portion of the window. In the exemplary embodiment, the chosen unit of measure is "inches," although other unit of measure options include: centimeters, points, picas, columns and percent. Width and Height 130 are text windows displaying the output dimensions of the exemplary high resolution digital image file. Width is shown as 23.92 inches and height is shown as 14 inches, based upon resolution values entered in 140 and units defined in 145. (In the exemplary embodiment, the high resolution digital image file has 7176 columns and 4200 rows which when divided by the output resolution of 300 pixels/inch provides the width dimension of 23.92 inches and a height dimension of 14 inches.) These dimensions may be adjusted to alter image scale by simply entering alternate values for the height and width. The Resolution window 140 displays the output pixel count, in this example, 300 per inch. Another pull-down menu 145 in the Print Options section of the window offers the choice of, pixels/inch as used in the exemplary embodiment, or pixels/centimeter. The Constrain Proportions "check box" 150 enables a user to lock the proportions of a file when adjusting values in any of the above text windows (height/width/resolution) found in the "Print Size" section. In "checking" this box, when a single dimension (width or height) is altered the corresponding dimension (width or height) is adjusted accordingly. Unchecked, this box allows for alteration of a single dimension, independent of the other. A resample image "check box" 160 determines whether a file is resampled as adjustments are made to the dimensions/resolution values of the file. Resampling the file will increase or decrease the quantity of information contained in the gross pixel dimension while either the height/width dimensions or the resolution remain constant. A pull-down menu 170 offers three different methods for resampling the image. In the exemplary embodiment bicubic resampling is the method used while other resampling options include nearest neighbor or bilinear.

Once again, it is to be readily understood that the dimensions of this high resolution digital file are set forth by way of example only and may vary greatly from that shown without departing from the scope of the present invention.

Referring to Figure 3, shown is a screen display illustrating the dimensions of a low resolution proxy file based on the high resolution digital image file from Figure 2. In this example, the low resolution proxy file remains dimensionally the same at 23.92" x 14", while the pixel count is reduced to a standard monitor resolution of 72 pixels/inch and the byte size is decreased dramatically to 4.97MB (4,970,000 bytes approx.). Skilled artisans will appreciate that the dimensions of this low resolution digital file may vary greatly from that shown without departing from the scope of the present invention.

Pixel Dimensions 90 displays the gross pixel count of a specified file. In the exemplary embodiment, the pixel count is that of the low resolution proxy file, 4.97MB (4,970,000 bytes approx.) generated from the sample high resolution file, originally 86.2MB (86,200,000 bytes approx.). The Width and Height windows 100 in this embodiment display the actual number of pixel columns (1722) and pixel rows (1008) of the low resolution proxy file. Width, having been reduced from 7176 columns to 1722 columns and height, formerly 4200 rows now 1008 rows, provides the new distributed representation of the gross pixel count of the low resolution proxy. A pull-down menu 110 allows for the selection of measuring units, either pixel as seen in the exemplary embodiment or percent.

Width and Height windows 130 display the output dimensions of the sample low resolution proxy file. Height is shown as 23.92 inches and width is shown as 14 inches, based upon resolution values entered in 140 and units defined in 145. (In the exemplary embodiment, the low resolution proxy file has 1722 columns and 1008 rows which when divided by the revised output resolution of 72 pixels/inch provides the width dimension of 23.92 inches and height dimension of 14 inches.) The Resolution window 140 displays the output pixel count, in the exemplary embodiment, 72 per inch.

It is to be readily understood that the dimensions of this low resolution proxy file may vary greatly from that shown without departing from the scope of the present invention. It should be appreciated that in reducing the high resolution file, originally 86.2MB, to 4.97, thus creating the low resolution proxy, only the value

entered in the resolution window was altered, going from 300 pixels per inch to 72 pixels per inch.

Referring to Figure 4, shown is a screen display illustrating a function for compressing the low resolution proxy file in accordance with the present invention. When saving the low resolution proxy file, a compression format is selected from a variety of available compression formats. In this example, JPEG is the selected compression format, which in turn offers various levels as seen in Figure 5.

An icon 280 defines the location of the folder to which the compressed file is being saved. The title bar of a pull-down menu 290 contains the name of the folder to which the compressed low resolution proxy file will be saved which in this embodiment is a folder entitled "Compressed Files." Options from this pull-down menu 290 include any storage location available the computer at the time of compression, including but not limited to hard drives, removable media and network servers. A window 300 displays the contents of what is contained in the folder or defined drive(s) selected and listed in the title bar of the pull-down menu 290. (In the exemplary embodiment the folder contains no items.) A text box 310 is provided for titling the file being compressed and saved. In this example the file being compressed bears the title "Low Resolution Proxy File." The pull-down menu 320 allows for the selection of one of many different file formats, including compression formats. Format choices found in this pull-down menu may include, but are not limited to, JPEG, Flashpix, GIF and PICT.

With continued reference to Figure 5, shown is a screen display illustrating the compression options available under the JPEG compression function. It should be noted that certain compression algorithms do not provide choices similar to those seen in Figure 4, but rather use a single level of compression by default.

A pull-down menu 330 within the "Image Options" window includes four options: "Maximum," "High," "Medium," and "Low." "Maximum" represents the least compressed or highest quality file. "Low" represents the most compressed or lowest quality file. "Medium" represents a file of intermediate compression and quality. The "Quality" selection box 340 in the Image Options window denotes a scale

of 0 to 10, wherein 0 represents the lowest quality (i.e. the most compressed or smallest) file, and wherein 10 represents the highest quality (i.e. the least compressed or largest) file. The slider scale 350 in the "Image Options" window shows a continuum from "small file" to "large file," wherein "small file" represents the lowest quality (i.e. the most compressed or smallest) file and "large file" represents the highest quality (i.e. the least compressed or largest) file. It should be noted that adjustment to any of the above mentioned "Image Options" could possibly alter one or both of the other "Image Options." The choice of which option to select may be based upon speed of use or desired quality with greater attention and finer tuning available through the Quality window. In the "Format Options" window, the Baseline option 360 selects the standard or original JPEG compression algorithm method which as seen in this embodiment. The Baseline Optimized option 370 selects a more recent compression method that maintains a greater degree of color integrity. The Progressive option 380 selects a file type designed for display in a web browser using multiple passes or scans, with each one increasingly higher in resolution, with the number of alternate resolutions entered into the Scans window 380. The Save Paths "check box" 390 allows for a path to be saved with the file. A path is designed to isolate a specific portion of an image.

Referring to Figure 6, shown is a screen display illustrating an information window noting the file size information of the compressed low resolution proxy image. In this example, the low resolution proxy when compressed according to the sample information provided in Figure 4 and Figure 5 now becomes a 204K file (134,143 bytes). The high resolution image has been scaled and compressed from 86MB to 204K, taking the optimal transfer time, based on a 56K modem operating in a vacuum, from 26 minutes to 4 seconds.

A thumbnail icon 400 of the file is provided, along with the title of the file which, in this embodiment, is "Low Resolution Proxy Image." Kind 410 provides the user with information pertaining to the file format. In this example, the file format is *Photoshop* JPEG. Size 420 provides the user with information pertaining to the quantity of information contained in the file mentioned in 400. In this example, the

file contains 163K or 134,143 bytes of information. Where 430 provides the user with information as to where the file listed in 400 currently resides. Created 440 provides the user with information as to when the compressed file mentioned in 400 was first compressed and saved. In this example, the date of creation is Tuesday, September 29, 1998 at 9:45 AM. Modified 450 provides the user with information as to when the compressed file mentioned in 400 was last altered or saved. In this example, the date is Tuesday, September 29, 1998 at 9:45 AM. (When the modification time/date match the creation date exactly a modification is often not involved.) Version 460 provides the user with information as to which version was used. In this example, the information is not available. Comments 470 provides the user with a text window in which information or comments regarding the file may be entered and stored with the file. The Lock "check box" 480 allows the user to "lock" the file, preventing further changes to the file from being saved under the same file name. The Stationary Pad "check box" 490 enables the user to generate a "stationary pad" file. Said "stationary pad" file is a copy of the original file on which any modifications are performed. These modifications will affect only the copy, or stationary pad file, leaving the original undisturbed.

Figures 7A & 7B collectively illustrate a sample script that performs certain functions to correct a specific file. The script includes, by way of example only, a Set CMYK Setup section, a first Curves section, an Unsharp Mask section, a Convert Mode section, a second Curves section, a Selective Color section, a Make Path section, a Set Clipping Path section, and a Save section. It is understood that the adjustments made in the exemplary embodiment are known to those skilled in the art.

Reference numeral 500 represents a defined folder in which the script is saved. The title or name 510 of the script created (#15432 in the exemplary embodiment). The Set CMYK Setup section 520 is provided to set the Cyan, Magenta, Yellow, Black transform of the current application. In the embodiment shown, the preference set for converting files into a specific printing environment is set to UCR, indicating Under Color Removal will be applied, as opposed to GCR (gray component replacement) with a 300% total ink limit allowed. The first Curves section 530 calls

out the various adjustments to be performed in the curves palette based upon the needs of the decompressed low resolution proxy file. These include adjustments of the tonal range in the red-green-blue color spectrum, such as a Shadow Adjust from a value of 0 to 20, Adjust ¼ Tone from a value of 40 to 60, Adjust ¾ Tone from a value of 220 to 189, Adjust Highlight from a value of 255 to 230. Channel 540 compensates for a color cast or imbalance requiring a midtone adjustment from a value of 130 to 140 made in the red channel. The Unsharp Mask section 550 documents the image sharpening functions using an unsharp mask filter. In this embodiment, Pixel Radius is set at 1.5, Amount is set at 200, and Threshold is set at 0. The Convert Mode section 560 documents any conversions in the color space of the decompressed low resolution proxy file. In this embodiment, the color space is converted from RGB to CMYK. The second Curves section 570 calls out the various adjustments of the tonal range in the CMYK color space. In this embodiment, these adjustments include Adjust ¼ Tone from a value of 51 to 63 and Adjust ¾ Tone from a value of 203 to 191.

The Selective Color section 580 documents the color correction adjustment to be performed on the decompressed low resolution proxy file. In this embodiment, these adjustments include, Color designated as red, with Cyan being removed at a value of -20 and Magenta being added at a value of 10. The Make Path section 590 documents a path constructed using the pen tool to isolate/silhouette an area from the background. The Set Clipping Path section 600 documents a path saved as a clipping path enabling the isolated portion of the image to be placed in a page layout program. The Save section 610 represents that the image is to be saved in the correct file format after the above mentioned tasks are performed.

Figure 8 illustrates a screen display of an information window for the script file shown in Figures 7 A&B. A thumbnail 620 of the Script file is provided, along with the title of the file which, in this embodiment, is "#15432." Kind 630 provides the user with information pertaining to the file format. In this example, the file format is *Photoshop* actions file. Size 640 provides the user with information pertaining to the quantity of information contained in the file mentioned in 620. In this example the file contains 68K or 1131 bytes of information. Where 650 provides the

user with information as to where the file listed in 620 currently resides. In the exemplary embodiment the file is found on the hard drive titled "4GB HD". Created 660 provides the user with information as to whether the compressed file mentioned in 620 was first compressed and saved. In this example, the date of creation is Tuesday, September 29, 1998 at 9:45 AM. Modified 670 provides the use with information as to when the compressed file mentioned in 620 was last altered or saved. In this example, the date is Tuesday, September 29, 1998 at 9:45 AM. (When the modification time/date match the creation date exactly a modification is often not involved.) Version 680 provides the user with information as to which version was used. In this example, the information is not available. Comments 690 provides the user with a text window in which information or comments regarding the file may be entered and stored with the file. In the exemplary embodiment, there are no comments. The Lock "check box" 700 allows the user to "lock" the file, preventing further changes to the file from being saved under the same file name. The Stationary Pad "check box" 710 enables the user to generate a "stationary pad" file. Said "stationary pad" file is a copy of the original file on which any modifications are performed. These modifications will affect only the copy, or stationary pad file, leaving the original undisturbed.

Referring to Figure 9, shown is a block diagram of an image modification system provided in accordance with one embodiment of the present invention. Specifically, the system demonstrates the workflow/methodology for transmitting compressed proxy images between an image origination station 720 and the image modification station 740 directly connected via a communication link 730. The image origination station 720 and image modification station 740 consist of, but are not limited to, a computer processing unit, display/monitor, input device (keyboard, tablet or mouse, etc.) and software application that accepts script technology. The communication link 730 may consist of, but is not limited to, a modem or network card and cable, but must open a link to other computers. Compressed proxy images are sent via communication link 730 from the image origination station 720 to the image modification station 740. The proxy image is decompressed, modified, scripted and

the modification script is sent via communication Link 730 to the image origination station 720 for application to the original high resolution digital image.

Referring to Figure 10, shown is a block diagram of an image modification system provided in accordance with an embodiment of the present invention. Specifically, the system demonstrates the workflow/methodology for transmitting compressed proxy images between multiple image origination stations 750 directly connected to an image modification station 770 via a communication link 760. The image origination stations 750 and image modification station 770 consist of, but are not limited to, a computer processing unit, display/monitor, input device (keyboard, tablet, or mouse, etc.) and software application that accepts script technology. The communication link may consist of, but is not limited to, a modem or network card and cable, but must open a link to other computers. Compressed proxy images are sent via communication link from the image origination stations 750 to the image modification station 770. The proxy image is decompressed, modified, scripted and the modification script is sent via communication link 760 to the respective image origination station 750 for application to the original high resolution digital image file.

Referring to Figure 11, shown is a diagram of an image modification system provided in accordance with a still further embodiment of the present invention. The image modification system demonstrates the workflow/methodology for transmitting compressed proxy images between two sites using a common drop off and pick up site. An image origination station 780 and image modification station 810 are connected to an intermediate drop-off/pick-up site 800 via a communication link 790. The image origination station 780 and image modification station 810 consist of, but are not limited to, a computer processing unit, display/monitor, input device (keyboard, tablet or mouse, etc.) and software application that accepts script technology. The communication link 790 may consist of, but is not limited to, a modem or network card and cable, but must open a link to other computers. The intermediate drop-off/pick-up site 800 may be, but is not limited to, an on-site server, Internet server, or remote ftp site. Compressed proxy images are sent via communication link 790 from the image origination site to the specified intermediate drop-off/pick-up site 800 whereby they

are retrieved by the image modification station 810 via communication link 790. The proxy image is decompressed, modified, scripted and the script is sent via communication link 790 to the intermediate drop-off/pick-up site 800 whereby it may be retrieved and transferred to the image origination station 780 for application to the original high resolution digital image file.

Referring to Figure 12, shown is a block diagram of an image modification system provided in accordance with yet another embodiment of the present invention. The image modification system demonstrates the workflow/methodology for transmitting compressed proxy images between multiple sites using a common drop off and pick up site. The image origination stations 820 and image modification station 850 are connected to an intermediate drop-off/pick-up site 840 via a communication link 830. The image origination stations 820 and image modification station 850 consist of, but are not limited to, a computer processing unit, display/monitor, input device (keyboard, tablet or mouse, etc.) and software application that accepts script technology. The communication link 830 may consist of, but is not limited to, a modem or network card and cable, but must open a link to other computers. The intermediate drop-off/pick-up site 840 may be, but is not limited to, an on-site server, Internet server or remote ftp site. Compressed proxy images are sent via communication link 830 from the image origination stations 820 to the specified intermediate drop-off/pick-up site 840, where they may be thereafter transferred to the image modification station 850 via communication link 830. The proxy image is decompressed, modified, scripted and the script is sent via communication link 830 to the intermediate drop-off/pick-up site 840 where it may thereafter be transferred to the proper image origination station 820 for application to the original high resolution digital image file.

Referring to Figure 13, shown is a block diagram of an image modification system of a still further embodiment of the present invention. More specifically, the image modification system is an alternate embodiment of that shown in Figures 11 and 12.

In another embodiment, the present method of modifying a digital image file is performed remotely on a portion of the high resolution digital image file viewed using streaming (image) data technology. As used herein "streaming data" technology refers to the continuous or real-time transfer of data from a source to a destination (or target). For example, the Real-time Protocol (RTP) delivers real-time content over the Internet (or other networks based on an IP protocol) for use with real-time applications. Typically, a separate protocol, the Real-Time Control Protocol (RTCP) is used with RTP to pass control messages for session management, rate adaptation and the like. Various embodiments of stream data technology are further disclosed in U.S. Patent Nos. 5,473,755 (Dunning); 5,918020 (Blackard et al.); and 5,928,331 (Bushmitch).

A variety of streaming data products are commercially available. RealTimeImage of San Bruno, CA offers an imaging technology called Pixels-On-Demand that streams real-time, full-resolution images, even over a 56k Internet connection. Progressive, on-demand image streaming permits the operator to zoom-in, pan or scroll, enabling 1:1 zoom ratio and higher. Real-time streaming of raw image data is accomplished without converting or compressing the image. An X-Y grid permits the operator to pinpoint on-screen the exact coordinates of the visual on on-screen.

The MrSID Imaging Server product available from LizardTech, Inc. of Seattle, WA provides high-resolution images of virtually any size. Panning and zooming features allow operator to explore images, without pixilation or delays.

Creo Products Inc. located in Vancouver, Canada offers the RenderView server that allows the operator to zoom in and out of an uncompressed image instantly, bringing minute details into full view, using standard Internet dial-up connections on PC or Macintosh computers. No batch processing or file conversion is required. The server handles industry-standard production files, including PostScript, EPS, PDF, DCS1,DCS2, JPEG, TIFF, TIFF/IT-P1, Scitex CT, Scitex LW and Scitex Page without conversion or compression. Support of ICC profiles enables the operator to receive an accurate on-line representation of the colors. Using progressive image-rendering, the RenderView server preserves the quality of the original image data, filling in detail

while the operator can focus or comment on different aspects of the image. View positions can be altered by scrolling, panning or zooming while the image continues streaming in. An X-Y grid allows the operator to pinpoint the exact coordinates within the image on-screen. A densitometer measures color values in any section of the original image, maximizing the operator's ability to evaluate color on-line.

The above-noted streaming data products, however, lack is an ability to modify, edit or alter the content of the image from the second location, although several allow for "mark-up" of the image based upon a Post-it™ style notation or writing directly on the image itself. These notations do not, however, change the image in any way. Additionally, a software application referred to as TIMBUKTU available from Netopia, Inc. of Los Altos, CA allow for the remote control of computers/software to modify a high resolution image. Using such a method, however, is extremely time consuming due to the fact that the changes to the entire high resolution image residing at a remote location are taking place in real time.

The present system includes a first computing station disposed at a first location, a second computing station disposed at a second location, and a communication system cooperatively coupled between the first and second computing stations. The high resolution digital image file resides on the first computing station. Full resolution portions of the high resolution digital image file are accessed at the second computing station using streaming image data technology.

A graphical user interface permits the operator at the second computing station to navigate the image at screen resolution until the desired segment for correction is found. Global or pixel level modifications are recorded at the second location to the portions of the uncompressed resolution digital image viewed as streaming data. The operator can either perform the modifications on the full resolution portion of the high resolution digital image or zoom-in on a desired section. The zoom-in function permits the operator to more easily perform the desired modifications, while the full resolution portion of the digital image permits the operator to better view the portion of image at a level of detail required to display the problem areas.

It will be appreciated that the request for high resolution segments/zoom-in views, while displaying detail beyond a 1:1 pixel relationship, can never exceed the overall displaying monitors x/y resolution. For example, on presently available high resolution 21 inch graphics monitors, the maximum resolution still is not often more than 1600x1200 pixels.

The present method of modifying a digital image file is performed by combining a browser type tool, such as Internet Explorer® or Netscape Navigator®, with an image editing application, such as PhotoShop. Alternatively, tools found in the image editing tool can be imported into the Internet browser.

Software is provided at the first location where the high resolution image resides. The first location can be the creators desktop or at a centralized media asset management facility. This software functions in conjunction with streaming data software to send/transmit streamed data. The software at the first location works with software at the second location in a client/server relationship, with recording/playback functions. An example of such software is a product referred to as ColorCourier available from Colorcentric.com, Inc. of Minneapolis, MN. The portion of the software that resides at the second location tracks all modification made to the digital data being streamed from the first location. The software at the second location can track global changes or pixel level changes. Pixel level changes can be linked to an X-Y grid within the portion of the streamed image available at the second location.

The modifications are saved as a script file independent of the high resolution image that is modified. In another embodiment, the key strokes and mouse clicks corresponding to the modifications made by the operator at the second location are recorded real-time using a macro function. The instructions recorded by the macro function can either be the script file or be used to generate a script file. The script file is then transferred back to the first location using the communication system, where it is applied to the original high resolution image to create a corrected high resolution digital image file.

In one embodiment, either the streaming data software or the software at the second location applies an x-y grid to the high resolution digital image. Pixel level

modifications are recorded on the x-y pixel grid at the second location. The changes to the x-y pixel grid generate a corrected x-y pixel grid. The script file transmitted to the first location contains parameters defining the corrected x-y pixel grid. The software at the first location applies the same x-y grid to the high resolution digital image. The corrected x-y pixel grid is compared to the uncorrected x-y pixel grid at the first location. The differential between the corrected x-y pixel grid and the x-y pixel grid applied at the first location represents, at least in part, the modifications. These modifications are then applied to the high resolution digital image to generate a corrected high resolution digital image.

In yet another alternate embodiment, the high resolution digital image file (or a portion thereof) is transferred to the image correction site either using conventional file transfer techniques or as streaming data without the prior steps of reducing the pixel count, and hence without reducing the image resolution. Consequently, any degradation to the digital image that may occur during reduction of the pixel count is avoided. This alternate embodiment is particularly useful where the high resolution digital image file is relatively small or the data transfer bandwidth is relatively high.

The high resolution digital image may be compressed to generate a compressed proxy file or may be sent to the image correction site in an uncompress format. In an embodiment where a compressed proxy file is sent to the image correction site, the compressed proxy file is decompressed at the image correction site to create a restored high resolution digital image. This decompression function may be accomplished via the chosen image correction software application.

The modifications are performed directly on the high resolution digital image or the restored high resolution digital image by the image correction specialist at the image correction site. The modifications are saved as a script file, as discussed herein. The script file is transmitted from the image correction site back to the image origination site. Due to the small size of the script file, it may be transmitted back to the image origination site in a quick and easy fashion. Finally, the script file is applied to the original high resolution digital image file to create a corrected high resolution

digital image file. This step is performed by playing the script file using the image correction software on the computing station at the image origination site. The corrected high resolution digital image file is then ready for use as desired.

As is evident from the foregoing, the present invention advantageously overcomes the drawbacks of the prior art. Specifically, the present invention provides the ability to modify high resolution digital image files without the need for sophisticated, expensive data transmission equipment, thereby leveling the playing field between competitors large and small alike.

Electronic Image Management System

The present invention is also directed to an electronic image management system 900 as illustrated in Figure 14. The electronic image management system 900 significantly reduces the storage space required to maintain multiple versions of a high resolution digital image file and reduces the amount of network traffic and processor time required to transfer, process and print high resolution digital master image files.

The electronic image management system 900 includes an image archive 902 at a first location 926 that preferably includes both a storage system 904 and a processor 906. The storage system 904 includes one or more high resolution digital master image files 908, 910. Each of the high resolution digital master image files is typically about 25 Mb to about 100 Mb or larger. Rather than storing different versions of the high resolution digital master image file 910 as full resolution files, the modifications corresponding to the different versions are stored as script files 912A, 912B, 912C, 912D (collectively referred to as "912"). Each of the script files 912 requires significantly less storage space (typically less than 100k) than the high resolution digital master image file 910.

As used herein, "version" refers to a high resolution digital master image file with certain modifications, including without limitation, edge sharpening, conversion to a different color space, global or pixel level corrections or adjustments such as exposure correction, neutralizing color casts, optimization of reproduction

range, image silhouetting, color alteration, pixel editing, retouching and color space conversion. For example, the RGB color space requires approximately 25 percent less storage space than the CMYK color space. Storing a high resolution digital master image file in an RGB color space can save approximately 2 to about 100 megabytes of space in the storage system 904. When a high resolution digital master image file is required, one or more of the script files is applied to convert the high resolution digital master image file to a different color space, such as the CMYK color space. In another example, high resolution digital master image files are smaller if stored without edge definition. When the high resolution digital master image file is required for some application, one or more of the script files is applied to amplify or multiple the edge definition (also referred to as "sharpening").

Processor 906 can apply one or more of the scripts 912 to the high resolution digital master image 910 to generate other versions 910A, 910B, 910C... of the high resolution digital master image 910. For some applications, multiple script files may be required to generate a single version of the high resolution digital master image file 910. For example, the version 910A may require application of the script file 912A to convert the high resolution digital master image file 910 from RGB space to CMYK space, the script file 912B to add edge sharpening and script files 912C to make substantive modifications.

In the first embodiment of the present electronic image management system 900, the high resolution digital master image file 910 is downloaded over communications system 914 to a remote user 916, such as a web press or an advertising agency. In addition to the high resolution digital master image file 910, one or more of the scripts 912 is sent to the remote user 916. The script file 912 is applied to the high resolution digital master image file 910 by the remote user 916 to generate one or more versions 910A, 910B, ... of the original high resolution digital image file 910. In an embodiment where multiple script files 912 are sent to the remote user 916, multiple versions 910A, 910B, ... of the high resolution digital master image file 910 can be created by applying those script files 912 to copies of the high resolution digital master image file 910, even though only a single copy of the

high resolution digital master image file 910 was sent over the communications system 914.

In another embodiment, second location 918 is a computer operated by an image correction specialist. The image correction specialist can generate multiple versions of the high resolution digital master image file 910 in the form of script files 912, which are then transmitted back to the archive 902. Alternatively, the script files can be sent directly to remote user 916 for use by a web press or advertising agency.

The script files generated at the second location 918 can also be sent to a printer 920 at a third location 922. The printer preferably includes processor 924 capable of applying script files 912 to the high resolution digital master image file 910. In this embodiment, the high resolution digital master image file 910 is sent only one time from the first location 926 to the third location 922. Multiple script files 912 however can be forwarded either directly from the archive 902 or indirectly from the second location 918 to the printer 920 at the third location 922 for processing and printing. In this configuration, multiple versions 910A, 910B, 910C... of the high resolution digital master image file 910 can be generated at the printer 920 and printed at the third location 922, even though the high resolution digital master image file 910 was sent across the communications system 914 only one time.

The operator as the second location can also initiate printing of versions of the high resolution digital master image file 910. One or more of the script files 912 can be applied to the high resolution digital master image file 910 at the first location 926. The version 910A is then sent from the first location 926 to the printer 920. In another embodiment, the operator sends a script file 912 from the second location 918 to the printer 920. The script file 912 optionally contains a pointer that instructs processor 924 to retrieve the high resolution digital master image file 910 from the first location 926, to apply the script file 912 to the high resolution digital master image file 910 at the third location 922 and prints the version 910A.

In another embodiment of the present electronic image management system 900, the high resolution digital master image file 910 is compressed to create a compressed copy file 930 of the high resolution digital image file 910. Lossless

compression is preferred. However, for some applications, lossy compression may be acceptable. In the present embodiment, the high resolution digital master image file 910 is compressed only one time.

The compressed copy file 930 can be sent to any of the locations 916, 918, 922, where it is decompressed and one or more of the scripts 912 are applied. For example, the compressed copy file 930 is sent to remote user 916 along with one or more of the script files 912. After the compressed copy file 930 is decompressed, the script files 912 are applied to the decompressed copy file of the high resolution image file to generate one or more versions 910A, 910B, ... of a high resolution digital master image file.

In another embodiment, the compressed copy file 930 is sent to second location 918. Again, the compressed copy file 930 is decompressed. The operator uses the decompress copy 930 of the high resolution digital image file to generate script files 912 corresponding to different versions. The script files 912 can be sent to the archive 902, to remote user 916 and/or to printer 920 at third location 922. The decompressed copy file at the location 918 is subsequently discarded to prevent further compression/decompression cycles. The primary compressed copy file 930 of the high resolution digital image file remains intact at the first location 926.

If the operator at the second location 918 wishes to print a version of the high resolution digital master image file 910 from the compressed copy file 930, the compressed copy file 930 is sent directly from the archive 902 to the printer 920 where it is decompressed by processor 924 and modified according to one or more of the script files 912. The script files 912 can come directly from the archive 902, from the operator at the second location 918 or a combination thereof. Using this workflow, the high resolution digital master image file 910 is only subject to a single compression/decompression cycle. The same methodology can be used when sending the compressed high resolution digital image file 930 to remote location 916.

In yet another embodiment of the present electronic image management system 900, a low resolution proxy 940 is created from the high resolution digital image file 910. The low resolution proxy 940 can be sent to the second location 918.

The low resolution proxy 940 can be used to generate script files 912. The script files are then sent to the archive 902, the remote user 916, or the third location 922.

As discussed above, the operator at location 918 can send the script file 912 over the communications system 914 directly to the printer 920. The script file contains a pointer that directs the processor 924 to retrieve the compressed copy file 930 from the archive 902. The processor 924 decompresses the compressed copy file 930 and applies the script 912. Alternatively, the pointer can direct the processor 924 to retrieve the high resolution digital master image file 910 from the archive 902 and to apply the script at the third location 922 prior to printing.

The present electronic image management system 900 minimizes the transmission of the high resolution digital master image files 908, 910 across the communications system 914. Additionally, multiple versions to the high resolution digital master image files 908, 910 can be stored as script files 912, conserving disk storage space. Multiple versions of the digital high resolution digital master image files 908, 910 can be sent to locations 916, 918, 922 in the form of script files 912 so that only a single copy of the high resolution digital master image files 908, 910 needs to be sent. The same methodology can be used with a compressed copy of the high resolution digital master image file, where the compressed copy file is decompressed before application of the scripts.

All of the patents and patent applications disclosed herein, including those set forth in the Background of the Invention, are hereby incorporated by reference. With regard to the foregoing description, it is to be understood that changes may be made in detail, without departing from the scope of the present invention. It is intended that the specification and depicted aspects be considered exemplary only, with a true scope and spirit of the invention being indicated by the broad meaning of the following claims.

What is claimed is:

1. A method of managing electronic images comprising the steps of:

storing a high resolution digital master image file at a first location; and

storing at the first location versions to the high resolution digital master image file as one or more script files.

2. The method of claim 1 comprising the steps of:

transferring the high resolution digital master image file from the first location to a second location;

transferring one or more of the script files from the first location to the second location; and

applying one or more of the script files to the high resolution digital master image file at the second location to produce one or more different versions of the high resolution digital master image file.

3. The method of claim 2 wherein the second location comprises a workstation.

4. The method of claim 1 comprising the steps of:

transferring the high resolution digital master image file from the first location to a second location;

performing at the second location at least one image modification on at least a portion of the high resolution digital master image file; and

saving at the second location instructions representing the image modifications as a supplemental script file.

5. The method of claim 4 comprising the step of transferring the supplemental script file from the second location to the first location.

6. The method of claim 4 comprising the steps of:

transferring the supplemental script file from the second location to the first location;

transferring the supplemental script file and the high resolution master image file from the first location to a third location; and

applying the supplemental script file to the high resolution master image file at the third location to produce a different version of the high resolution digital master image file.

7. The method of claim 4 comprising the steps of:

transferring the supplemental script file from the second location to the first location;

transferring the one or more of the script files, the supplemental script file and the high resolution master image file from the first location to a third location; and

applying the one or more script files and the supplemental script file to the high resolution master image file at the third location to produce a different version of the high resolution digital master image file.

8. The method of claim 4 comprising the steps of:

transferring the supplemental script files from the second location to a third location; and

transferring the high resolution master image file from the first location to a third location; and

applying the supplemental script file to the high resolution master image file at the third location to produce a different version of the high resolution digital master image file.

9. The method of claim 4 comprising the steps of:

transferring the supplemental script files from the second location to a third location; and

transferring one or more of the script files and the high resolution master image file from the first location to a third location; and

applying the one or more script files and the supplemental script file to the high resolution master image file at the third location to produce a different version of the high resolution digital master image file.

10. The method of claim 4 wherein the step of transferring the high resolution digital master image file from the first location to the second location comprises the step of transferring at least a portion of the high resolution digital master image file to the second location as streaming data.

11. The method of claim 1 comprising the steps of:

transferring one or more of the script files from the first location to a printer; and

transferring the high resolution master image file from the first location to the printer; and

applying one or more of the script files to the high resolution master image file at the printer to produce one or more different versions of the high resolution digital master image file;

printing one or more of the different versions of the high resolution digital master image file.

12. The method of claim 11 comprising the step of initiating from a second location the transfer of the one or more script files and the high resolution digital master image file from the first location to the printer.

13. The method of claim 1 wherein one or more of the script files are adapted to convert the high resolution master image file from one color space to another color space.

14. The method of claim 1 wherein one or more of the script files are adapted to apply edge definition to the high resolution master image file.

15. The method of claim 1 wherein one or more of the script files are adapted to perform pixel level editing of the high resolution master image file.

16. The method of claim 1 wherein at least one of the script files is adapted to alter one or more color on at least a portion of the high resolution digital master image file.

17. A method of managing electronic images comprising the steps of:

storing a high resolution digital master image file at a first location;

storing a compressed copy file of the high resolution digital master image file at the first location; and

storing at the first location versions to the high resolution digital master image file as one or more script files.

18. The method of claim 17 comprising the steps of:

transferring the compressed copy file from the first location to a second location;

transferring one or more of the script files from the first location to the second location;

decompressing the compressed copy file at the second location to obtain a decompressed copy file of the high resolution digital master image file; and

applying one or more of the script files to the decompressed copy file at the second location to produce one or more different versions of the high resolution digital master image file.

19. The method of claim 18 wherein the second location comprises a workstation.

20. The method of claim 17 comprising the steps of:

transferring the compressed copy file from the first location to a second location;

decompressing at the second location the compressed copy file to obtain a decompressed copy file of the high resolution digital master image file; and

performing at the second location at least one image modification on at least a portion of the decompressed copy file; and

saving at the second location instructions representing the image modifications as a supplemental script file.

21. The method of claim 20 comprising the step of transferring the supplemental script file from the second location to the first location.

22. The method of claim 20 comprising the steps of:

transferring the supplemental script file from the second location to the first location;

transferring the supplemental script file and the compressed copy file from the first location to a third location;

decompressing the compressed copy file at the third location to obtain a decompressed copy file of the high resolution digital master image file; and

applying the supplemental script file to the decompressed copy file at the third location to produce a different version of the high resolution digital master image file.

23. The method of claim 20 comprising the steps of:

transferring the supplemental script file from the second location to the first location;

transferring the supplemental script file and the high resolution master image file from the first location to a third location;

applying the supplemental script file to the high resolution master image file at the third location to produce a different version of the high resolution digital master image file.

24. The method of claim 20 comprising the steps of:

transferring the supplemental script files from the second location to a third location; and

transferring the compressed copy file from the first location to a third location;

decompressing the compressed copy file at the third location to obtain a decompressed copy file of the high resolution digital master image file; and

applying the supplemental script file to the decompressed copy file at the third location to produce a different version of the high resolution digital master image file.

25. The method of claim 20 comprising the steps of:

transferring the supplemental script files from the second location to a third location; and

transferring the high resolution master image file from the first location to a third location; and

applying the supplemental script file to the high resolution master image file at the third location to produce a different version of the high resolution digital master image file.

26. The method of claim 17 comprising the steps of:

transferring one or more of the script files from the first location to a printer; and

transferring the compressed copy file from the first location to the printer;

decompressing the compressed copy file at the printer to obtain a decompressed copy file of the high resolution digital master image file;

applying one or more of the script files to the decompressed copy file at the printer to produce one or more different versions of the high resolution digital master image file; and

printing one or more of the different versions of the high resolution digital master image file.

27. The method of claim 26 comprising the step of initiating from a second location the transfer of the one or more script files and the compressed copy file from the first location to the printer.

28. The method of claim 17 wherein one or more of the script files are adapted to convert the high resolution master image file from one color space to another color space.

29. The method of claim 17 wherein one or more of the script files are adapted to apply edge definition to the high resolution master image file.

30. The method of claim 17 wherein one or more of the script files are adapted to perform pixel level editing of the high resolution master image file.

31. The method of claim 17 wherein at least one of the script files is adapted to alter one or more color on at least a portion of the high resolution digital master image file.

32. An electronic image management system comprising:

a first computer system at a first location including an image archive including one or more high resolution digital master image files and one or more script files corresponding to versions of the high resolution digital master images;

a second computer system at a second location including a processor programmed to apply one or more of the script files to one or more of the high resolution digital master image files; and

a communication system cooperatively coupled between the first and second computer systems.

33. The electronic image management system of claim 32 comprising a printer at a third location coupled to the first and second computer systems through the communication system.

34. The electronic image management system of claim 32 comprising a compressed copy file of the high resolution digital image file at the first computer system.

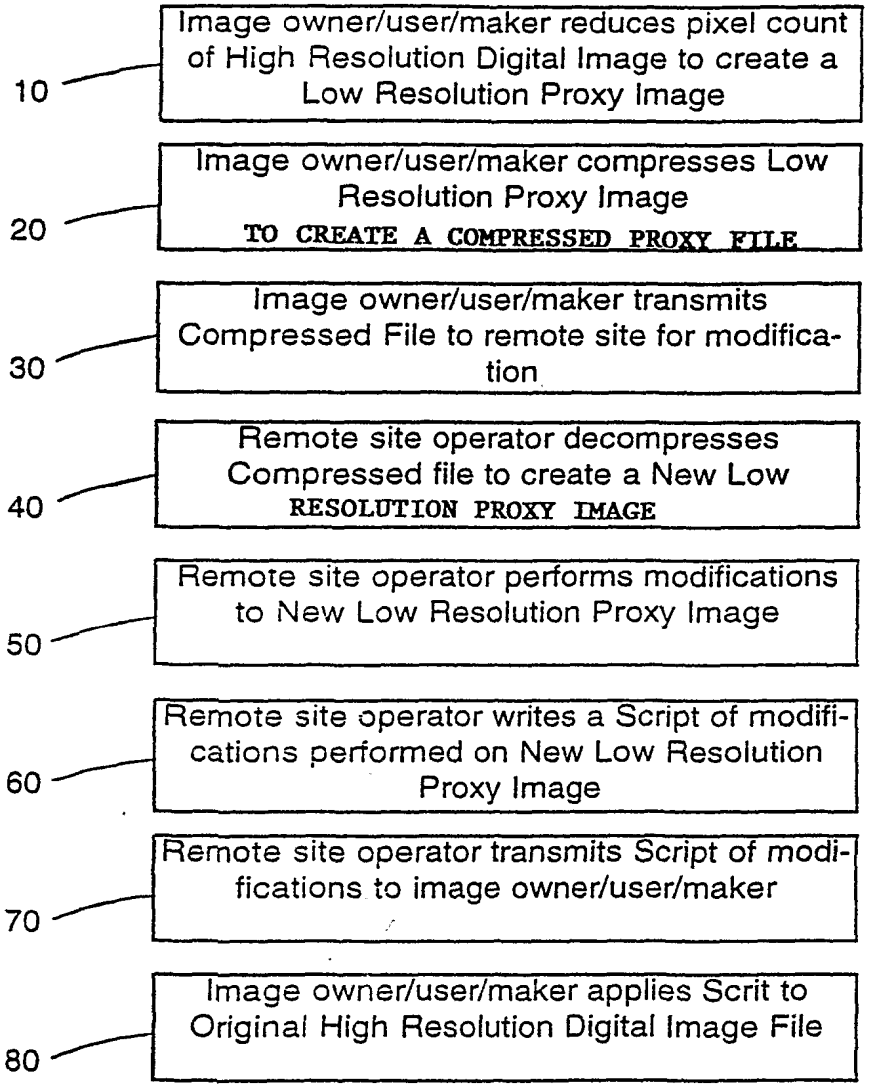

10
Image owner/user/maker reduces pixel count of High Resolution Digital Image to create a Low Resolution Proxy Image
20
Image owner/user/maker compresses Low Resolution Proxy Image TO CREATE A COMPRESSED PROXY FILE
30
Image owner/user/maker transmits Compressed File to remote site for modification
40
Remote site operator decompresses Compressed file to create a New Low RESOLUTION PROXY IMAGE
50
Remote site operator performs modifications to New Low Resolution Proxy Image
60
Remote site operator writes a Script of modifications performed on New Low Resolution Proxy Image
70
Remote site operator transmits Script of modifications to image owner/user/maker
80
Image owner/user/maker applies Scrit to Original High Resolution Digital Image File

FIGURE 1

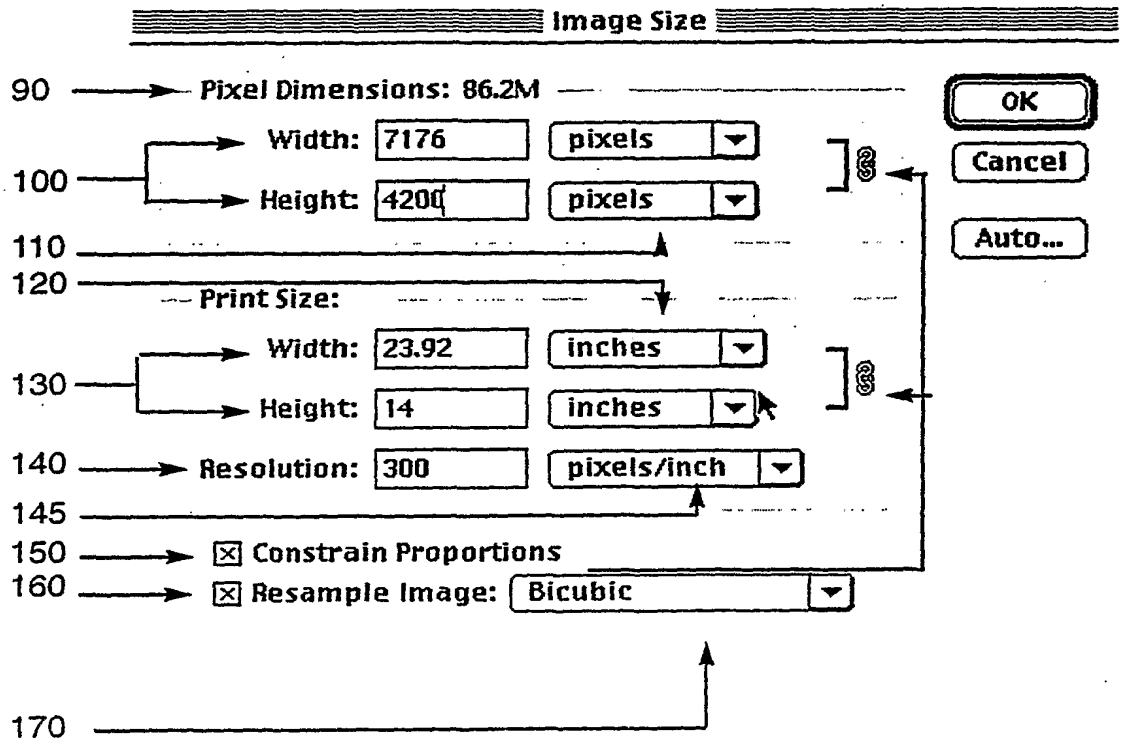


Image Size
90
Pixel Dimensions: 86.2M
OK
Width: 7176 pixels
100
Height: 4200 pixels
Cancel
Auto...
110
120
Print Size:
Width: 23.92 inches
130
Height: 14 inches
140
Resolution: 300 pixels/inch
145
150
Constrain Proportions
160
Resample Image: Bicubic
170

FIGURE 2

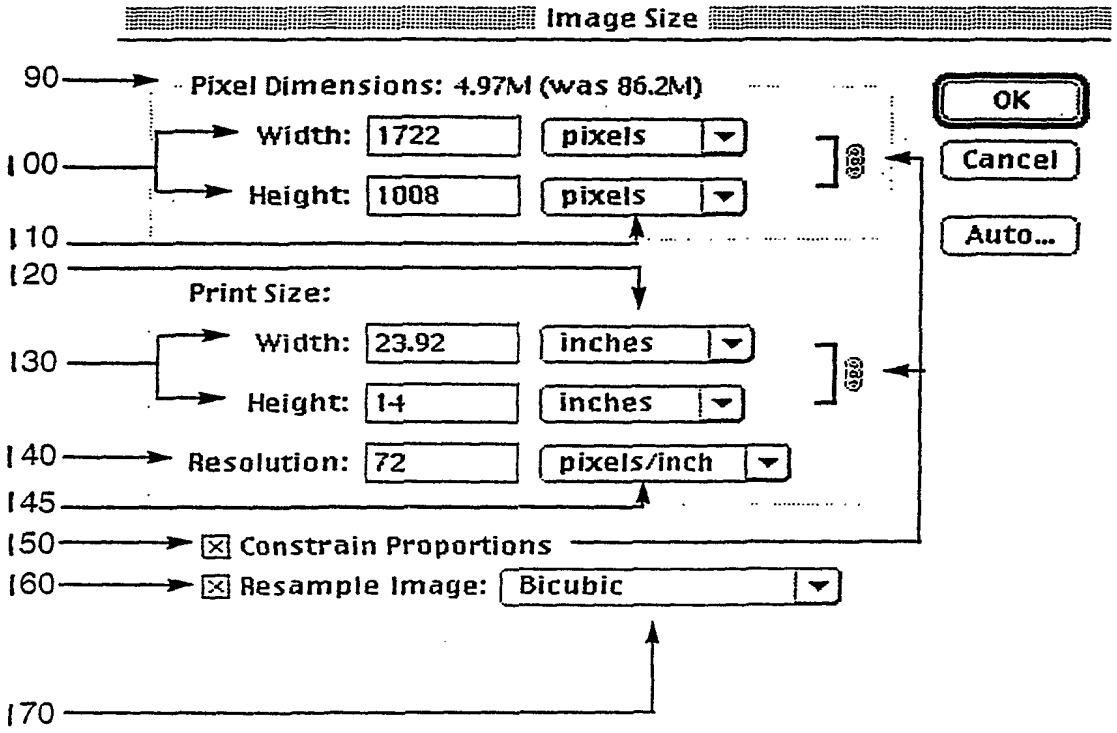


Image Size
90
Pixel Dimensions: 4.97M (was 86.2M)
OK
Cancel
Auto...
100
Width: 1722 pixels
Height: 1008 pixels
110
120
Print Size:
130
Width: 23.92 inches
Height: 14 inches
140
Resolution: 72 pixels/inch
145
150
Constrain Proportions
160
Resample Image: Bicubic
170

FIGURE 3

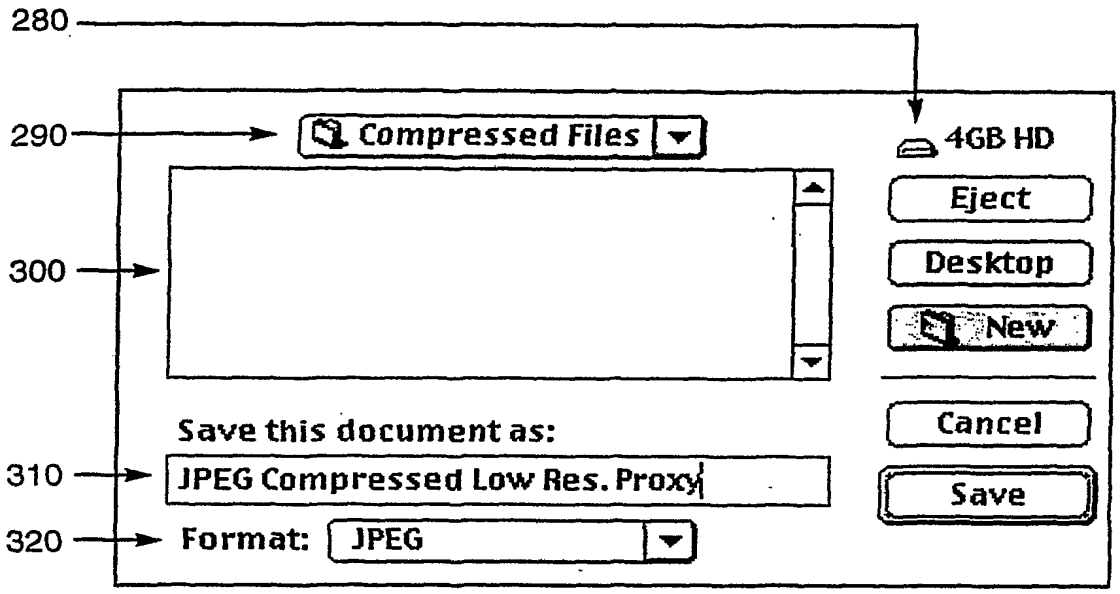

280
290
Compressed Files
4GB HD
Eject
300
Desktop
New
Cancel
Save this document as:
310
JPEG Compressed Low Res. Proxy
320
Format:
JPEG
Save

FIGURE 4

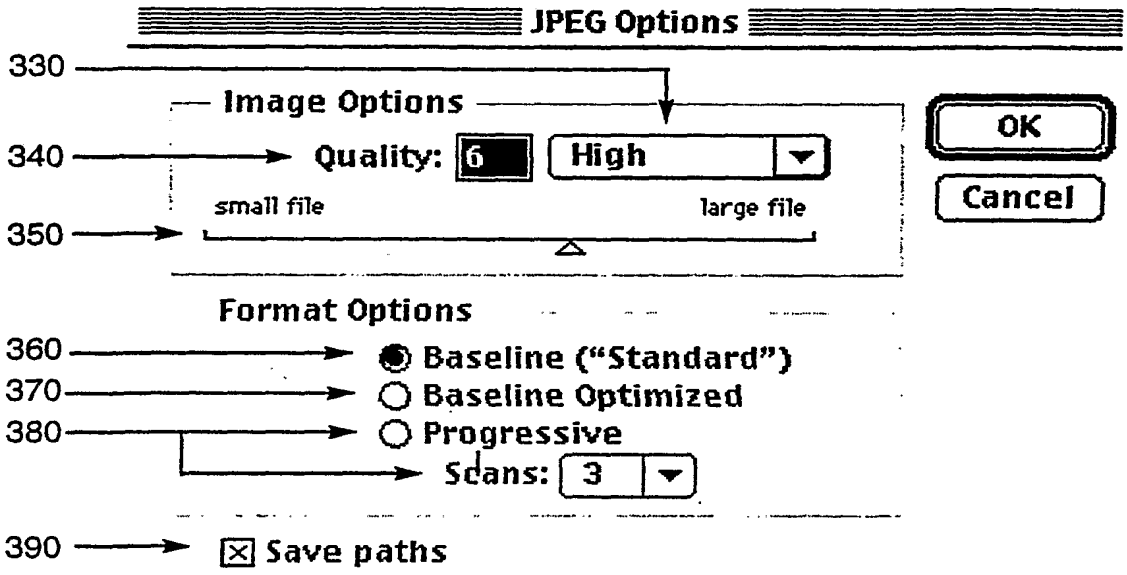

JPEG Options
330
Image Options
340
Quality: 6
High
OK
Cancel
small file
large file
350
Format Options
360
Baseline ("Standard")
370
Baseline Optimized
380
Progressive
Scans: 3
390
Save paths

FIGURE 5

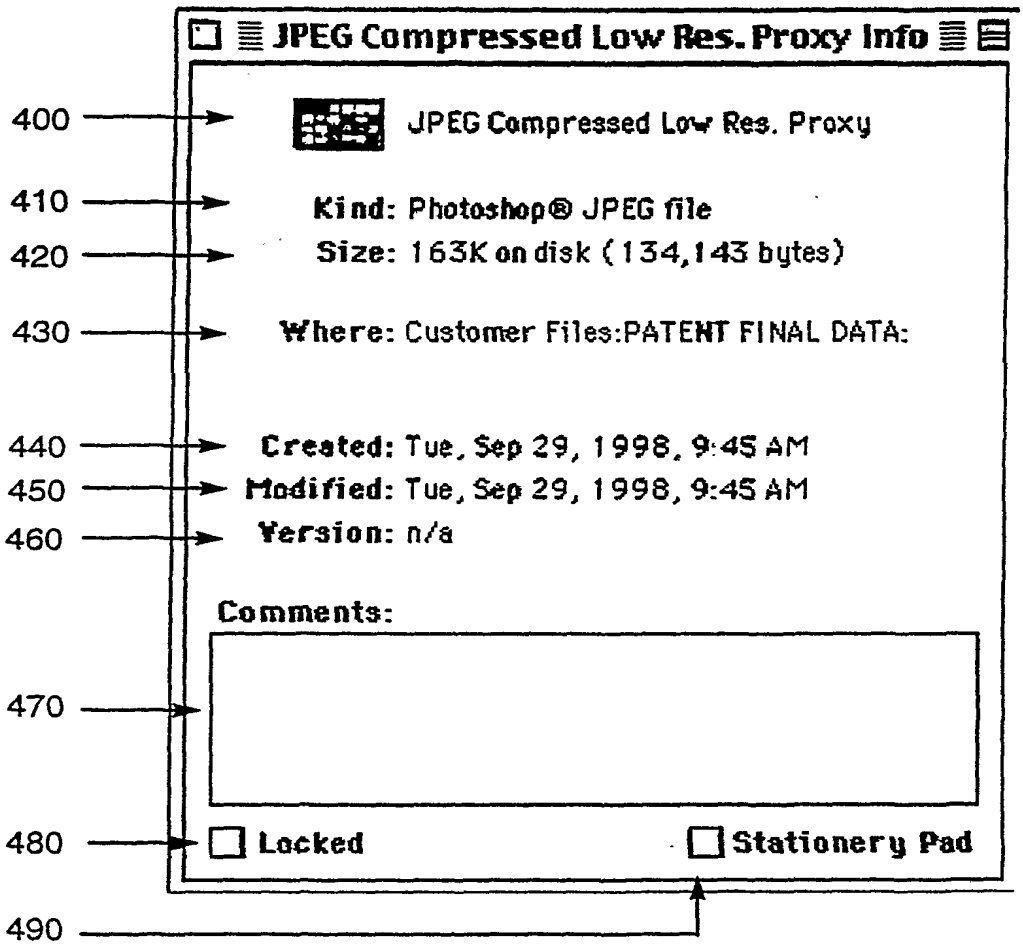

JPEG Compressed Low Res. Proxy Info
400
JPEG Compressed Low Res. Proxy
410
Kind: Photoshop® JPEG file
420
Size: 163K on disk (134,143 bytes)
430
Where: Customer Files:PATENT FINAL DATA:
440
Created: Tue, Sep 29, 1998, 9:45 AM
450
Modified: Tue, Sep 29, 1998, 9:45 AM
460
Version: n/a
Comments:
470
480
Locked
Stationery Pad
490

FIGURE 6

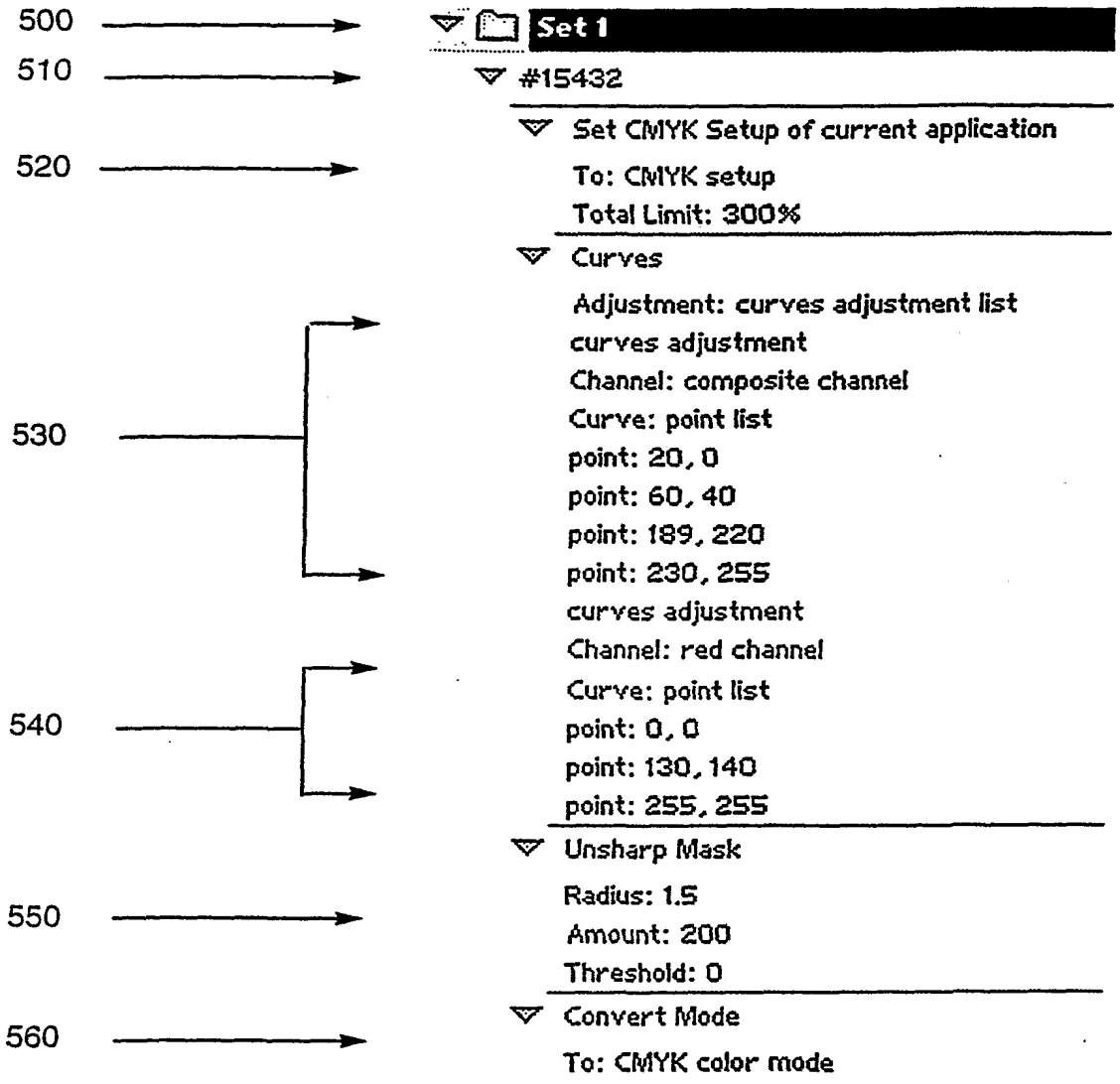

500
510
520
530
540
550
560
Set 1
#15432
Set CMYK Setup of current application
To: CMYK setup
Total Limit: 300%
Curves
Adjustment: curves adjustment list
curves adjustment
Channel: composite channel
Curve: point list
point: 20, 0
point: 60, 40
point: 189, 220
point: 230, 255
curves adjustment
Channel: red channel
Curve: point list
point: 0, 0
point: 130, 140
point: 255, 255
Unsharp Mask
Radius: 1.5
Amount: 200
Threshold: 0
Convert Mode
To: CMYK color mode

FIGURE 7A

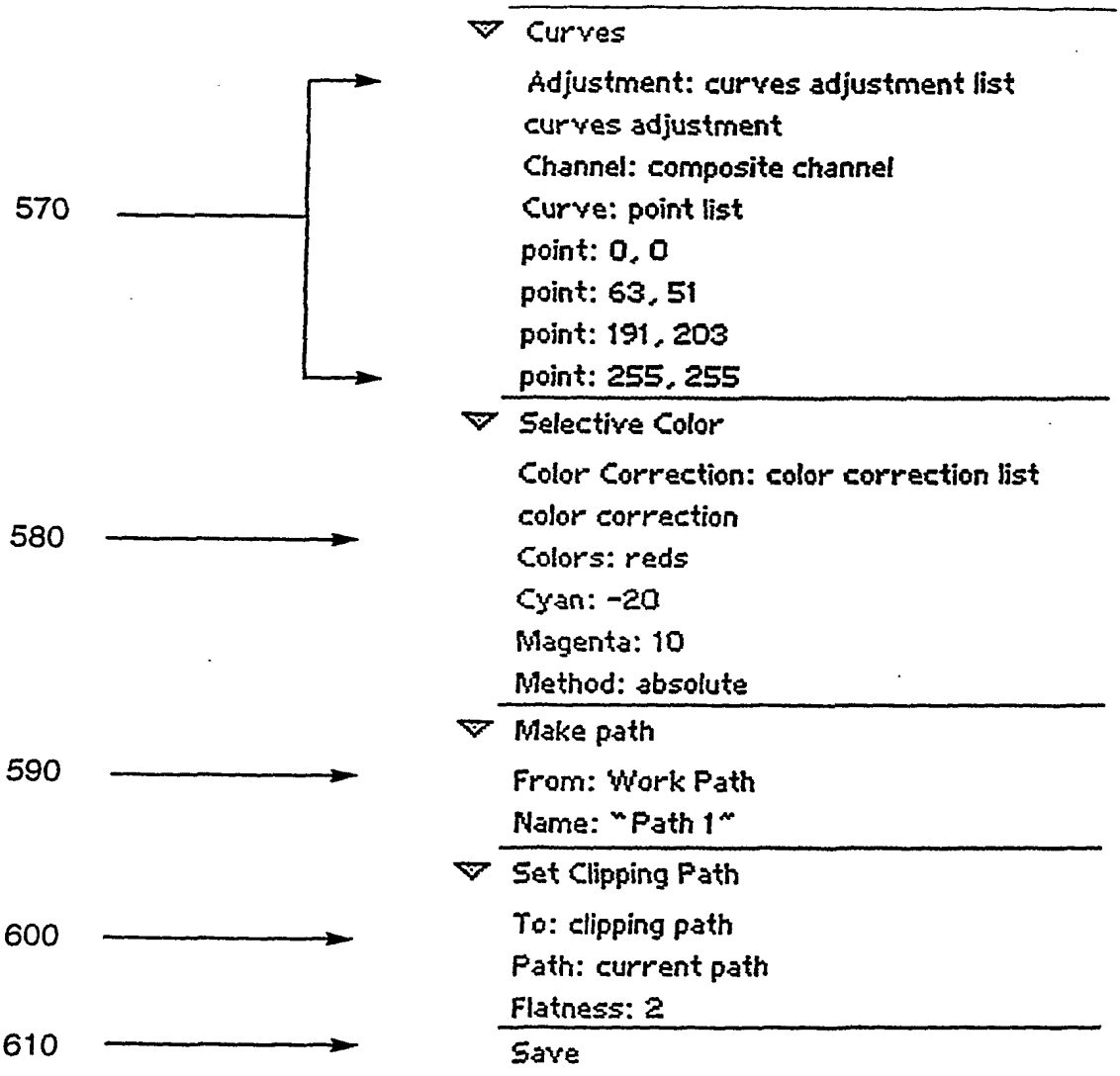

Curves
Adjustment: curves adjustment list
curves adjustment
Channel: composite channel
Curve: point list
point: 0, 0
point: 63, 51
point: 191, 203
point: 255, 255
570
Selective Color
Color Correction: color correction list
color correction
Colors: reds
Cyan: -20
Magenta: 10
Method: absolute
580
Make path
From: Work Path
Name: "Path 1"
590
Set Clipping Path
To: clipping path
Path: current path
Flatness: 2
600
Save
610

FIGURE 7B

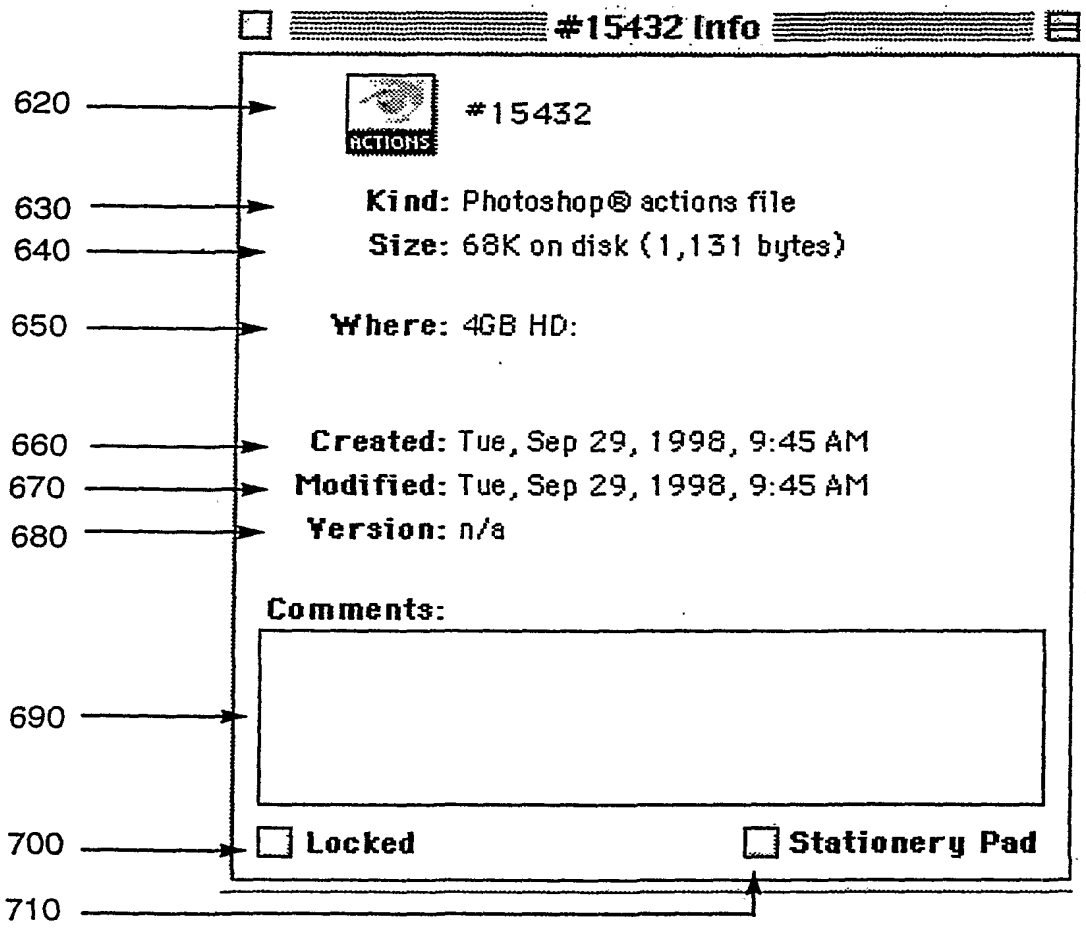

#15432 Info
620
#15432
ACTIONS
630
Kind: Photoshop® actions file
640
Size: 68K on disk (1,131 bytes)
650
Where: 4GB HD:
660
Created: Tue, Sep 29, 1998, 9:45 AM
670
Modified: Tue, Sep 29, 1998, 9:45 AM
680
Version: n/a
Comments:
690
700
Locked
Stationery Pad
710

FIGURE 8

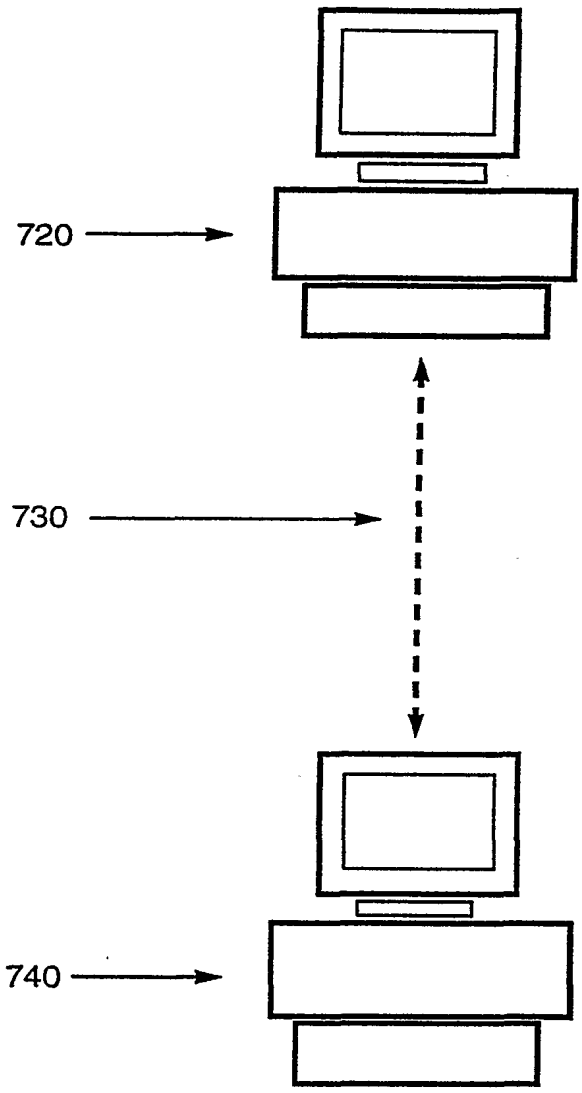


FIGURE 9

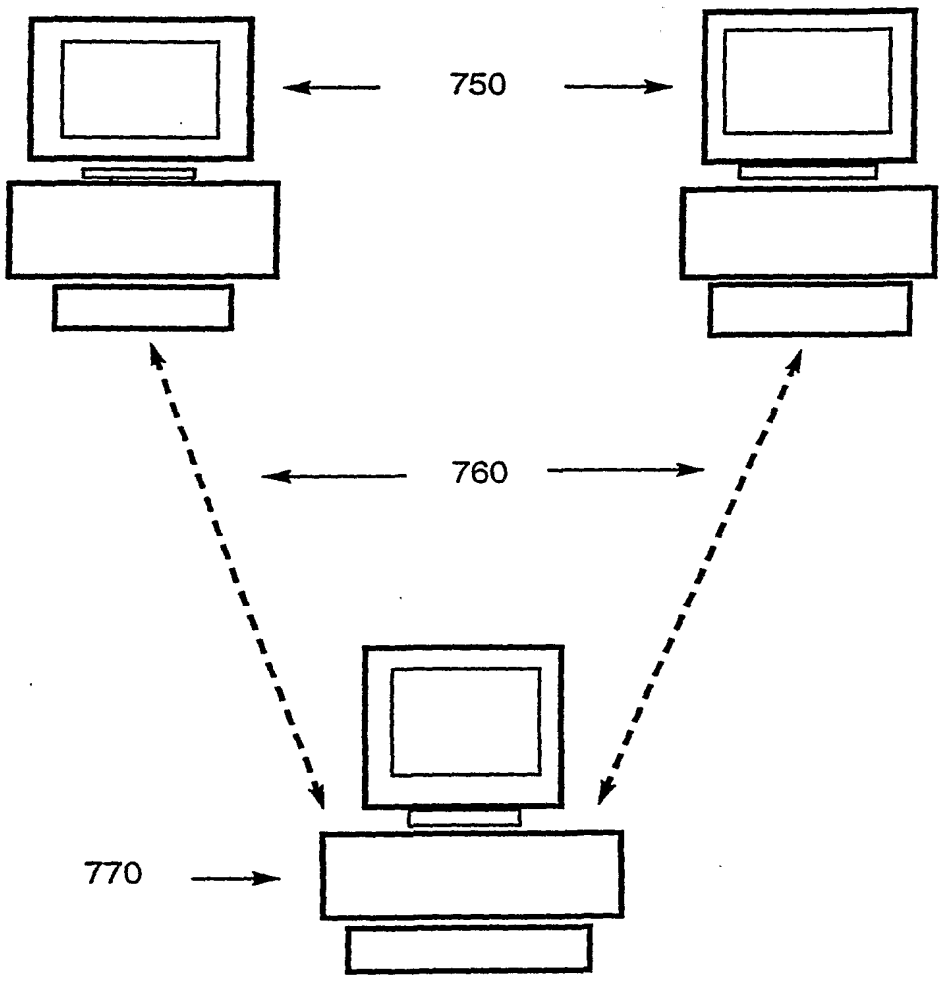


FIGURE 10

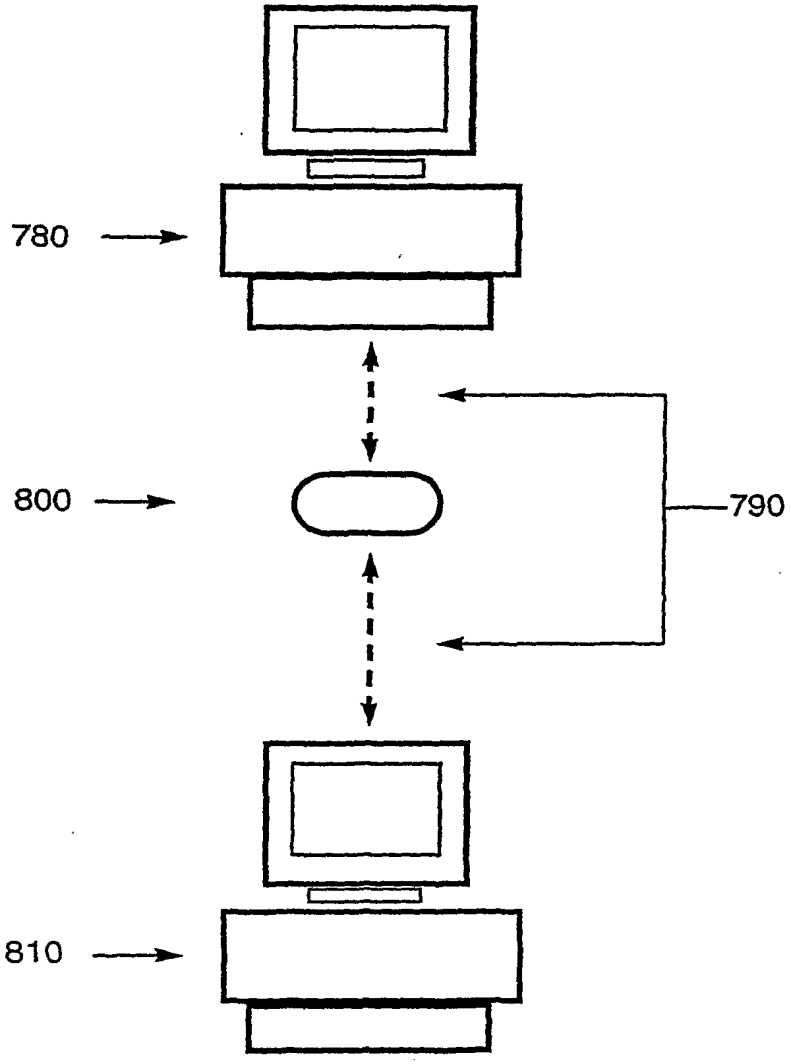


FIGURE 11

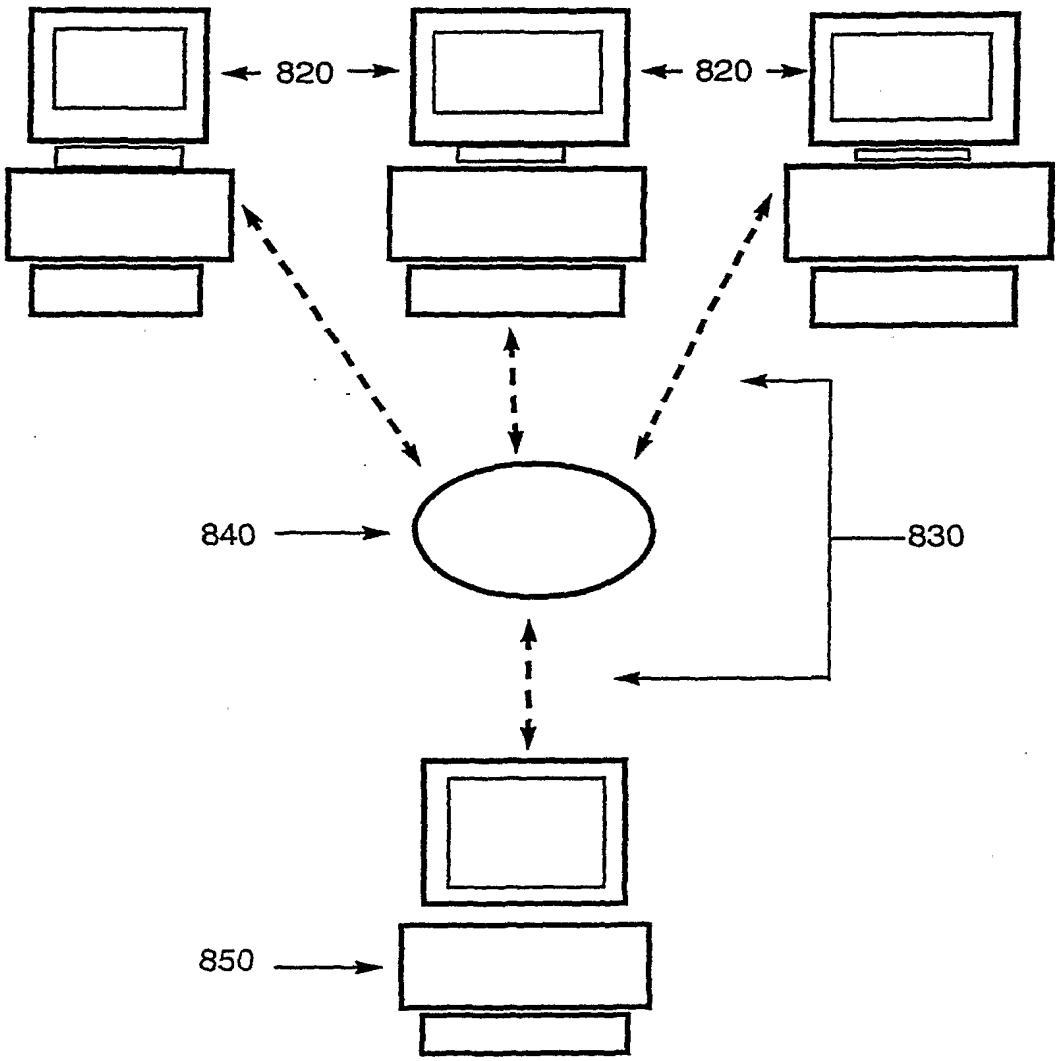


FIGURE 12

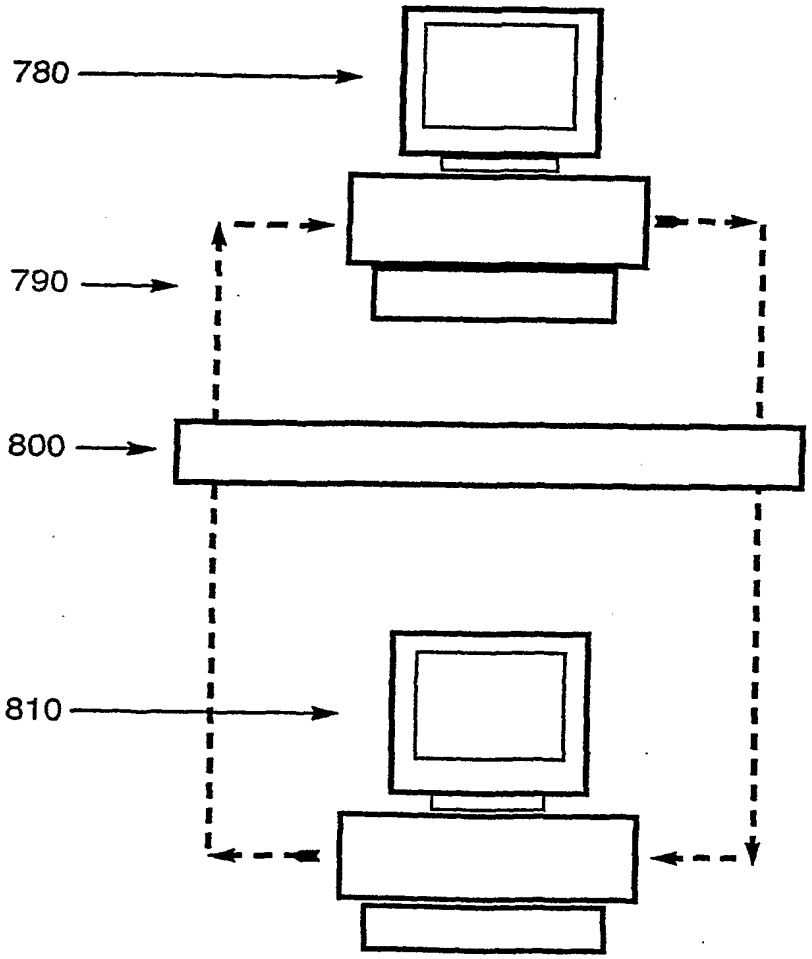
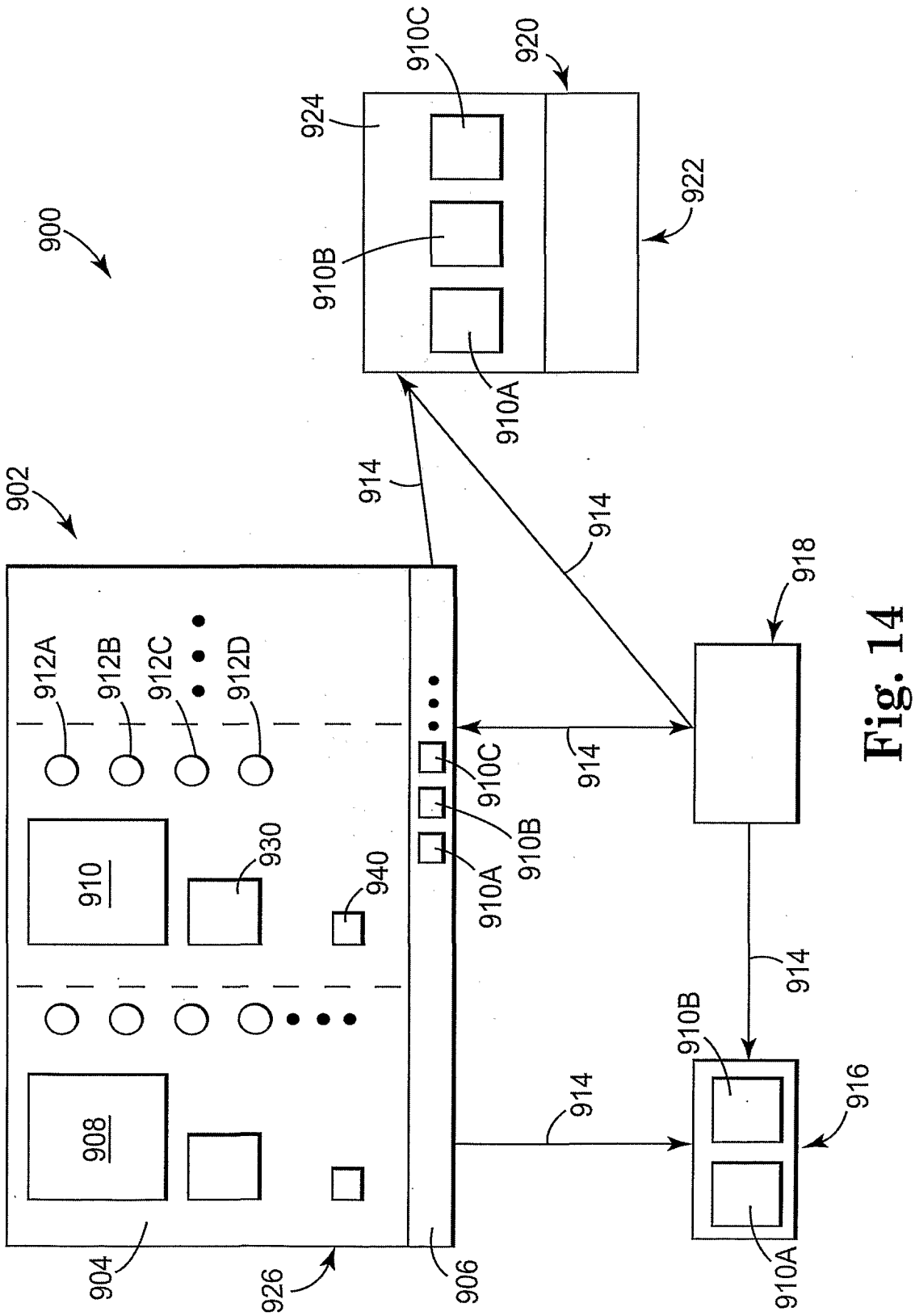


FIGURE 13


900
902
904
906
908
910
910A
910B
910C
912A
912B
912C
912D
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916
918
920
922
924
926
930
940

Fig. 14

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US02/04457

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :Please See Extra Sheet.
US CL : 345/698, 350; 382/309; 358/1.18, 78, 442; 386/52; 705/26
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 345/698, 350; 382/309; 358/1.18, 78, 442; 386/52; 705/26

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,119,081 A (IKEHIRA) 02 June 1992, col. 2, lines 53-64, col. 4, lines 5-61).	1-34
X,P	US 6,282,330 B1 (YOKOTA et al) 28 August 2001, col.1, lines 31-46, col. 5, line 16-col. 15, lines 66.	1-34
Y,P	US 6,327,049 B1 (OHTSUKA) 04 December 2001, col. 2-col.6, lines 1-67, and col. 8, line 18-col. 9, line 38.	1-34
Y	US 6,192,184 B1 (SHIOTA et al) 20 February 2001,col. 2, line1-col. 4, line 50.	1-50
Y,E	US 6,362,900 B1 (SQUILLA et al) 26 March 2002, col. 4, line 27-col.9, line 35.	1-34

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 03 MAY 2002	Date of mailing of the international search report 05 JUN 2002
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer GLENTON BURGESS Telephone No. (703) -305-4792

Form PCT/ISA/210 (second sheet) (July 1998)★

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US02/04457

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,185,662 (LISTON) 09 February 1993, col. 1, line 46-col.4, line 57.	1-34
Y	US 6,167,382 (SPARKS et al) 26 December 2000, col. 4, line 22-col. 11, lines 12.	1-34
Y,P	US 6,288,719 B1(SQUILLA et al) 11 September 2001, col. 4, line 18-col. 6, line 65.	1-34

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US02/04457

A. CLASSIFICATION OF SUBJECT MATTER:
IPC (7):

G09G 1/06; G06K 9/03, 15/00, G06F 3/00, 17/60, H04N 5/87,1/32, 1/40